little phatty® analog synthesizer

Stage II Edition

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Foreword

Congratulations on your purchase of a Moog Little Phatty Stage II. We are truly appreciative that you have chosen to be a Moog customer. We want you to be thrilled with your purchase and we want the LP Stage II to match your creative energy, so we have packed it with an abundance of sonic capability.

The Little Phatty Stage II is a great performance synth. If you read through this manual carefully and incorporate all the Little Phatty has to offer in your rig you may find that you do not need another synth or MIDI controller for live performance. Look for even more templates and libraries to support the Phatty as a controller in the months to come.

We are constantly evolving our product offerings and so I hope you will register your product on our website and trust us with your email address so we can send you updates via our electronic newsletter.

The Little Phatty sounds great and is intuitively easy to use. We hope you are reading this manual after a week or so of sleepless but blissful nights playing the Little Phatty. The Phatty user interface was designed to have you up and running in a matter of minutes.

The Little Phatty is built with care and pride by our team in Asheville, N.C. If you have a chance to come to the beautiful mountains of Western North Carolina, call and come by and see us. We would be happy to take you on a tour of the factory.

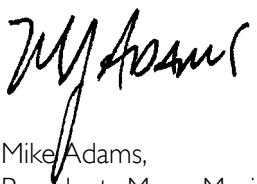
The Look of the Stage II is something we hope you appreciate as well. Moog products are known for their durability and we are confident the Phatty will uphold that tradition. One of the new features of the Phatty is the rubberized side panels. We agonized over this aspect of the product and I think we have come up with just the right combination of durability and feel. I hope you appreciate this small but important aspect of the product.

I must recognize the hard working team that created the Little Phatty. Of course, it starts with Bob and his vision for the product. The Engineering team of Cyril Lance, Steve Dunnington, Amos Gaynes, and Mike Peio made it happen. The design of any product is always the product of many minds but the Phatty design starts with Axel Hartmann. If you ever have to service the Phatty you will thank mechanical engineering genius Klaus Weber. The software for the LP was developed by the team of Chuck Carlson and Cyril Lance.

If you enjoy this manual, thank Greg Kist! And then there was a host of artists who participated in the design process: Brian Kehew, Roger O'Donnell, Tom Brislin, Nigel Hopkins, Michael Vallarella, Keiichi Goto, Tomo Nakamura, Mineto Yamaguchi, Mark Pulver, Steve Molitz, Eric Svalgard, Jordan Rudess, Nick Montoya. The internal Moog marketing team: Chris Stack, Linda Lafferty, Siobhan Robinson, and Heidi Bucher all contributed their part to the success of this project. And finally, nobody takes more pride in what they do than the production folks at Moog Music led by Mike Peio, Plant Manager.

It was Bob's dream and it is our pleasure to bring this performance synth to you. We are very excited for you and expect this product will provide a lifetime of musical enjoyment.

Let us hear from you as we hope you enjoy it as much as we have enjoyed bringing it to you!



Mike Adams,
President, Moog Music

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How to Use this Manual

The *Setup and Connections* section explains how to unpack, setup and connect the Little Phatty, and provides a quick start to get you up and running with your new synthesizer.

The *Components* section offers detailed explanations of the components that create and modify sound.

First time users should check out the *Tutorial* in Appendix F, where you will find an explanation of sound and subtractive synthesis.

For those interested MIDI interface specifics, see the section titled *How the LP handles MIDI* (page 54), as well as the *MIDI Implementation Chart*, which appears in Appendix G.

Throughout the manual you will see icons that point out additional information:

This icon indicates an important note concerning the operation of the Little Phatty.

This icon indicates a useful performance or programming tip.

This icon indicates technical information for the advanced user or the technically curious.

Setup and Connections

In a perfect world, everyone would read the User's Manual from cover to cover before connecting and playing their new instrument. For those of you who don't live in a perfect world and can't wait to play your new synthesizer, the following should get you set up and running quickly.

NOTE: We encourage you to read the entire manual at some point to learn more about the instrument and gain a better understanding of what you can do with the Little Phatty.

Check the contents in the shipping carton

The Little Phatty is shipped with the following items:

1. The Little Phatty Synthesizer
2. Power cord
3. Users Manual
4. Warranty registration card

What you will need

In addition to the Little Phatty and provided accessories, you will need:

1. A stand or table sufficient to support the Little Phatty
2. A ¼" instrument cable and amplifier, or a pair of headphones
3. A properly wired AC outlet.

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Set up

Make sure you have an adequate place to set up your Little Phatty. You will need a sturdy keyboard stand or table that will support a 22 lb. analog synthesizer and will not topple if you play hard. Use caution when lifting the Little Phatty out of the carton, and be sure to save the carton and all packing material in case you need to ship the Little Phatty for any reason.

Connect to Power

Connect the Little Phatty's power receptacle (on the side panel) to a wall outlet using the supplied AC power cord. The Little Phatty's universal power supply will operate with a power source from 90 to 250 Volts AC, 50/60Hz.

Power up

Turn the power on. You will see the LCD screen light up and display the message:

Little Phatty
Version X.x

After a few seconds the start-up screen will disappear and the current preset will appear in the display. The **PRESET** button will be illuminated in amber, the name of the current preset location and preset name will be displayed on the top line of the LCD screen, and the message 'PRESET ACTIVE' will be displayed on the lower line of the LCD screen.

Connect to Amplifier

Set the Little Phatty's Volume control to minimum before connecting to an amplifier or headphones. Adjust the amplifier level for a comfortable listening level, and then slowly bring up the Little Phatty's volume. Make sure the **OUTPUT ON/OFF** switch is illuminated red – this means the output is turned on.

Start Playing

Use the **VALUE** knob to scroll through the presets. All preset locations (00 – 99) are loaded with sounds from the factory. There are a total of 100 locations in memory for presets – all are user programmable. Note that once a preset is called up, you can tweak the parameters to your liking using the front panel controls. Any changes made to the current preset will cause the **PRESET** button to change its illumination from amber to red, and the lower line of the LCD screen will change to 'PANEL ACTIVE'. If you make changes to a preset and want to return to the original sound, press **PRESET**. You can toggle between the stored preset and the current edited preset by pressing the **PRESET** button until you change presets. If you wish to save your changes – refer to the section on Storing Presets on page 23. Any changes made to a preset will be lost if they are not saved once you change to a new preset.

Warranty registration

Moog's on-line warranty registration system is the best way to activate your warranty. Access the Moog web site at www.moogmusic.com and click on the "Product Register" tab. If you complete all the requested information, Moog Music will send you a complimentary gift.

NOTE: The Little Phatty is recommended for an operating temperature between about 50 and 100 degrees Fahrenheit. It is safe to operate the synthesizer outside of this range (between 0 and 125 degrees F), but the LP's voltage controlled oscillators (VCOs) may not remain in tune.

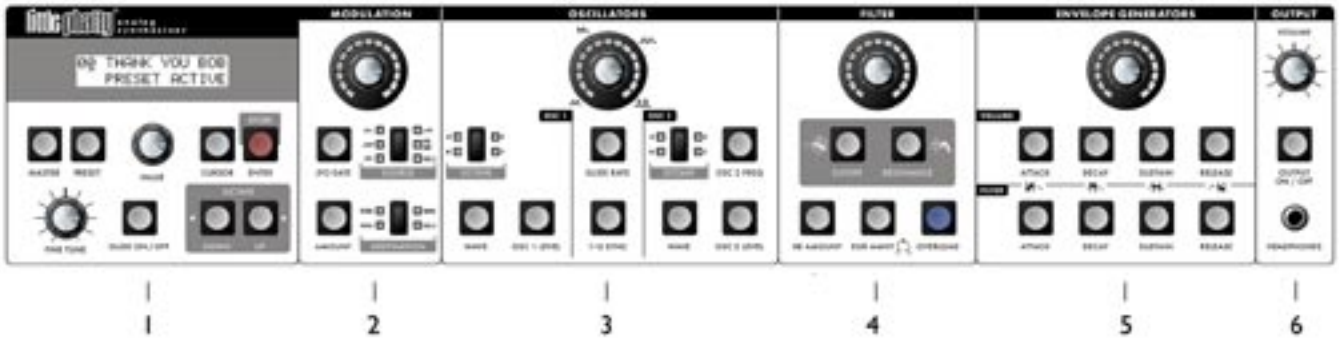
It is recommended that a warm up period of about 15 minutes be allowed before using the LP. The LP's VCOs use a heated chip design that take a short time to warm up. The warm up period may be longer if the LP has been stored outside the recommended operating temperature range.

Overview and Features

The Little Phatty (LP for short) is a monophonic analog synthesizer that is a descendant of the classic Minimoog Model D. The LP features 2 ultra-stable oscillators, a genuine Moog 24dB/Octave low pass filter, two 4-stage analog envelope generators and a flexible modulation matrix. The LP's front panel has four variable-function edit controls for real time adjustment of the Modulation, Oscillator, Filter and Envelope Generator parameters, plus dedicated controls for Fine Tuning, Octave Switching, Glide, and Volume. The User Interface section has the controls for Preset selection and management, adjustment of global parameters, and System Exclusive MIDI function and utilities. The LP features 100 factory preset sounds, which can be modified or replaced by your own sounds.

Here's a brief description of the front panel components.

Front Panel:



1. The LCD display and User Interface - provides controls to access presets and other software functions. The Fine Tune control is located here, along with switches for Glide On/Off and Octave transpose.

2. The Modulation section - features a programmable modulation matrix. The Modulation section has controls to select the modulation Source (LFO Triangle, LFO Square, LFO Sawtooth, LFO Ramp, Filter EG or Oscillator 2) the LFO Rate, the modulation Destination (Pitch, Filter, Waveform or Oscillator 2) and the modulation Amount parameters. The output of the Modulation section is routed through the Modulation Wheel; when the Mod Wheel is all the way forward the Mod Source passes to the Mod Destination at the level set by the Mod Amount.

3. The Oscillators section - features two analog oscillators, each with individual Octave, Level and Waveform controls. Additional controls are provided for tuning the second oscillator relative to the first, setting the Glide Rate, and engaging Oscillator Sync. The oscillator outputs are summed together along with the External Audio Input and routed to the Filter section.

4. The Filter section - features the classic Moog 24dB/Octave 'ladder filter', and includes controls for adjusting Cutoff Frequency, Resonance, Keyboard Amount, Envelope Amount, and Overload. The output of the Filter is routed to the output Voltage Controlled Amplifier (VCA), which is controlled by the Volume Envelope Generator.

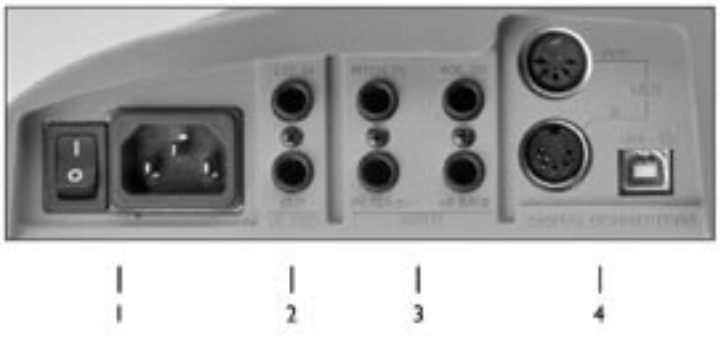
5. The Envelope Generator (EG) section - contains two ADSR-style envelopes, one for the Filter and one for the Volume. The EG section includes controls for adjusting the Attack, Decay, Sustain and Release parameters of each envelope.

Front Panel (con't):

6. The Output section - includes controls for adjusting the Master Volume, a switch to toggle the output on and off, and a headphone jack. The Master Volume is used for setting the levels of both the output and the headphones. The Output On/Off switch affects the Audio Output, but not the headphones.

Side Panel:

The side panel provides connections for Power, MIDI, Control Voltage Input and Audio I/O:



1. Power Socket and Switch – provides power to the LP. Power is ON when the switch is in the up position.

2. Audio jacks – provides monophonic audio input and audio output connections. The Audio Input jack allows external signals to be processed by the Little Phatty.

3. Control Voltage jacks – provides Control Voltage/Expression Pedal inputs for Pitch, Filter, and Volume parameters, and a keyboard Gate input to trigger the envelope generators with a footswitch or gate signal. These inputs allow the LP to be controlled from expression pedals, or CV devices like the Moogerfooger® CP-251 Control Processor.

4. MIDI – provides MIDI Input/Output to other MIDI devices through either MIDI DIN or USB connections (software selectable).

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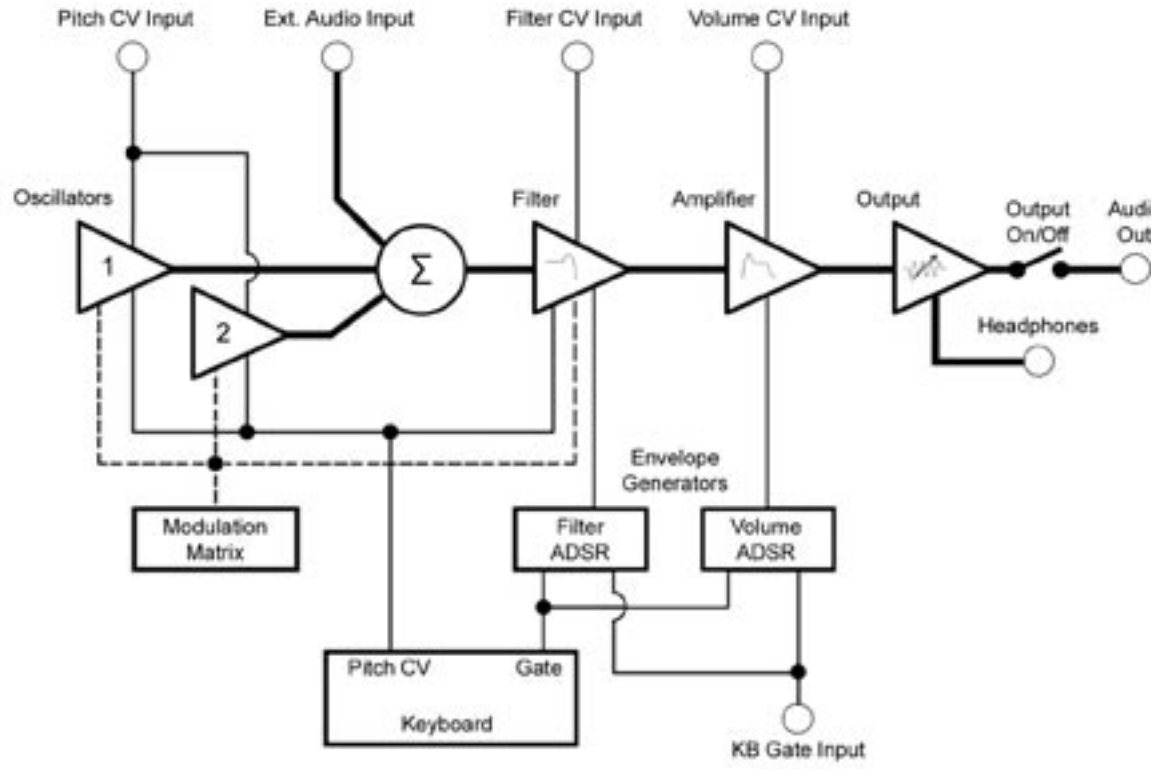
Signal Flow

To understand the operation of the Little Phatty, take a look at the diagram below. The diagram shows the flow of the audio, control voltage and modulation signals in the Little Phatty. Heavy lines are used to indicate audio signals, which flow from left to right. Lighter lines indicate the control voltages (CV's), which flow from the top and bottom. Dotted lines indicate programmable modulation routings.



Referring to the above diagram, the LP's source signals are created by two voltage-controlled oscillators and are mixed together with the external audio input signal. This combined audio signal is passed to the low-pass filter, where the tone is sculpted according to the settings of the filter parameters and the Filter ADSR envelope. The signal then passes to the amplifier stage, where the Volume ADSR envelope shapes it. Finally, the signal is routed to the output section, where the final level is set by the Master Volume control.

The keyboard is the main control source of the Little Phatty. Each time a key is pressed, the keyboard produces Pitch CV and Gate signals. The Pitch signal is used to specify the pitch of the oscillators, and is also applied to the Filter to control the filter cutoff. The Gate signal is used to simultaneously trigger the Filter and Volume Envelope Generators. The LP can also be controlled through a MIDI connection (not shown), or through the CV and Gate trigger connections. The resulting sound depends on the various parameter settings of the oscillators, filter, envelope generators and modulation matrix, plus any additional CV connections.

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Basic Operation

The LP has two operating modes: Master and Preset.

- Master mode allows you to access and change global parameters and other utility options. A complete list of the Master mode functions and parameters is shown on page 26.

- Preset mode allows you to access the presets and manipulate the sound from the front panel controls. The Preset mode is the main operating mode for editing and playing the LP. Information on Preset mode is found on page 23.

When the LP is powered on, it starts up in Preset mode. In this mode, you select presets using the **VALUE** encoder. You can rotate the **VALUE** encoder to step through the presets in either direction. Pressing the encoder while rotating increments the preset selection by +10 or -10 presets. In Preset mode, you'll see the current preset displayed on the top line of the LCD display, and a 'Preset Active' message on the bottom line. The **PRESET** button is illuminated in amber. When you edit a preset, the bottom line of the display changes to 'Panel Active' and the **PRESET** button changes from amber to red, indicating that you are editing the preset sound. By pressing the **PRESET** button you can toggle between the preset (stored) and edited (panel) sounds. Note that once you change preset numbers, any edits made to the previous preset will be lost unless the edits are saved.

Editing a preset is simple. There are four analog editing controls on the front panel, one for each of the four sound shaping sections (Modulation, Oscillators, Filter, and Envelope Generators). Each control is surrounded by a ring of 15 LEDs that indicate approximately the stored or edited value of the current parameter. The parameters for each section are chosen by pushing the switch for the desired parameter in that section. That switch then becomes illuminated in amber. Only one parameter can be activated at a time for editing in each section.

Some parameters offer multiple selections (such as the Modulation SOURCE switch, shown at right). Pressing that switch advances through the six possible Modulation sources. For the On/Off type switches like GLIDE ON/OFF (above), 1-2 SYNC or OUTPUT ON/OFF, the switch is illuminated red when the parameter is turned on, and goes out when the parameter is turned off.

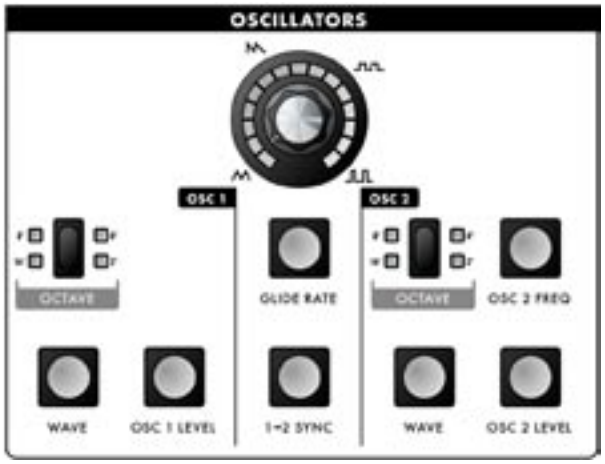
TECH NOTE: The LP's editing controls are actually analog potentiometers. When certain key parameters are selected, the analog control signal is switched to control that parameter directly. This is called RAC™ (Real Analog Control). RAC gives the LP a responsiveness that can only be achieved with analog control by providing direct access to the analog control signal path; straight to the synthesizer circuits. In the Stage Edition, RAC provides responsive analog control for the Osc 1 & 2, Filter Cutoff, Filter Resonance, EG Amount, Overload and Filter EG Sustain parameters.

The Components

Now let's take a look at the individual module components that make up the Little Phatty Synthesizer, starting with the Oscillator section and moving right across the front panel, explaining the features and functions of the Filter, Envelope Generator and Output sections. Then we'll cover the Modulation section, the Keyboard and Left-Hand controls, the Input/Output Side Panel, and the User Interface section.

A. The Oscillator Section

The Oscillators are the main sound source of the Little Phatty. The oscillators in the LP are analog Voltage Controlled Oscillators (VCOs) that feature a temperature regulation circuit that provides them with excellent tuning stability. The LP's VCOs can produce a total musical range of 9 octaves!



Oscillator One serves as a master oscillator to which Oscillator 2 is tuned. The timbres of the oscillators are adjusted by their variable waveform (Wave) controls. There is also a switch for syncing Oscillator 2 to Oscillator 1, and a control for adjusting the glide rate which is explained below.

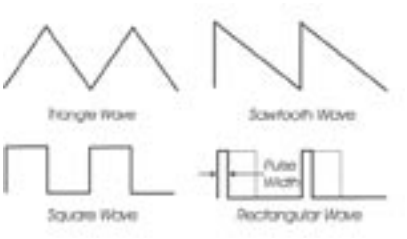
The frequencies of the oscillators are controlled by a number of sources. The main source is the keyboard. The keyboard creates a voltage that allows the oscillators to be played in an equal tempered scale. The glide circuit can be switched in between the Keyboard CV and the oscillators to slow the changes between notes (portamento). The Keyboard CV is mixed with the Octave switch CV, the Frequency control (Oscillator 2), the Pitch Bend Wheel, the Pitch CV In (on the side panel), the fine tune control, and the output of the Mod Matrix when the "Pitch" destination is selected.

Oscillator Section Controls:

Octave:
Each Oscillator has a switch labeled **OCTAVE** that selects the relative frequency range. To select the octave, simply press the switch. Each press of the switch advances the setting, as indicated by the corresponding LED. When the topmost octave is reached, the next button press cycles back to the lowest octave. The panel markings 16', 8', 4' and 2' are octave standards based on organ stops. On the 16' setting the highest A on the keyboard is A440.

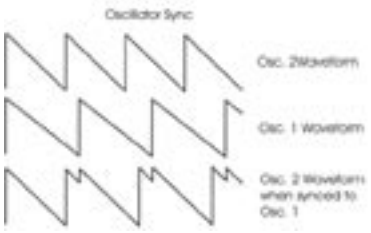
Oscillator Level:
Each oscillator has a switch labeled **OSC LEVEL** that allows the analog edit control to adjust the oscillator level. This allows you to control the relative strength of each oscillator in the mixer.

Waveform:
Each oscillator has a switch labeled **WAVE** that allows the analog edit control to modify the waveform. The waveform is continuously variable from triangle, to sawtooth, to square, to rectangular. The waveform is morphed gradually from one to another as the value control is rotated. The legend around the analog edit control for the oscillator section indicates the knob positions to obtain the triangle, sawtooth, square and skinniest pulse waveforms. Because the waveform is voltage controlled, this parameter can be modulated. This allows the generation of some very interesting timbral changes. By limiting the modulation between the square and thin rectangle (pulse) waves, you can get pulse width modulation, a classic analog synthesizer sound. Although the waveforms can be set from the front panel individually for each oscillator, modulation is applied to both waveform controls simultaneously. When using modulation, it is possible to make the width of the rectangular wave so skinny that it becomes silent.



Frequency:
Oscillator 2 has a switch labeled **OSC 2 FREQ** that allows the analog edit control to adjust the frequency of Oscillator 2 relative to Oscillator 1. The pitch of Oscillator 2 can be adjusted up or down 7 semitones (± a fifth). By changing the pitch of Oscillator 2, more than one frequency can be played when a key is pressed, creating intervals for large adjustments, or to get a chorus sound when the oscillators are just slightly out of tune. Note that Oscillator 1 does not have a frequency control because it is designed to serve as a reference oscillator.

Sync:
In the center of the oscillator panel is a switch labeled **1–2 SYNC.** This is an ON/OFF type switch that has no interaction with the analog edit control. Sync is ON when the **1-2 SYNC** switch is lit. With sync on, Oscillator 2 is synchronized (synced) to Oscillator 1, forcing Oscillator 2 to restart its waveform from the beginning each time Oscillator 1 starts a new waveform cycle. The effect is noticeable if the synced Oscillator is a higher frequency than the Reset Oscillator. The main frequency heard is that of the reset oscillator. As the frequency of the synced oscillator is swept, it reinforces the harmonics of the reset oscillator. Use the Oscillator 2 Frequency control to hear this effect. Depending on how it is applied, the effect can be aggressive or warm and vocal.



Glide Rate:
In the center of the oscillator panel is a switch labeled **GLIDE RATE.** When this is selected, the analog edit control is used to set the glide rate (portamento) between notes. A Glide switch on the User Interface panel (on the far left) turns the Glide effect on or off. Glide is the time it takes to go from one note to the next. The glide rate can vary from virtually instantaneous to a very slow glide (about 5 seconds to go from the lowest C to the highest C on the keyboard).

Additional CV control:
The **PITCH** jack on the side-panel is a CV input for external control of the oscillator pitch. This input controls the frequencies of both oscillators. A 1-volt change of this voltage will change the pitch by NOMINALLY one octave. The jack accepts -5 to +5 volts, or an expression pedal like the EP-2.

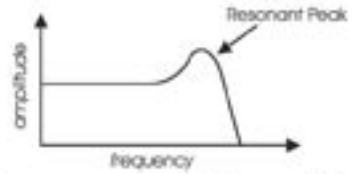
PERFORMANCE TIP: A steady control voltage applied to the PITCH jack will offset the base pitch of both oscillators. You can use this feature to transpose the keyboard to any desired interval applying the appropriate steady-state CV. See Appendix J for more information on how to configure this.

B. The Filter Section

Filters are used for adjusting the timbre of an audio signal. Filters modify sound by attenuating some frequencies while allowing others to pass through unaffected. An important term to understand regarding filters is "Cutoff Frequency". This is the point at which frequencies begin to be rejected. The LP features a lowpass filter, which behaves as its name indicates: it allows low frequencies to pass and rejects high frequencies.

Another important aspect of filters is the cutoff slope. The cutoff slope defines how well the filter rejects signals above the cutoff frequency. The cutoff slope is measured in decibels per octave (dB/Octave), and is specified as a multiple of six. A 6dB/Octave slope (the simplest possible filter design) exhibits a gentle roll-off with a minimum rejection of frequencies above the cutoff. By comparison, a 12dB/Octave slope is twice as steep, and rejects frequencies above the cutoff twice as fast. An 18dB/Octave slope is steeper still, with a corresponding frequency rejection. Finally, a 24dB/Octave slope provides the steepest rejection of frequencies above the cutoff point. The classic Moog filter is a 24dB/Octave lowpass filter.

The Moog filter also features a parameter called Resonance. This parameter adds a resonant peak at the cutoff frequency. When the resonant peak passes through the overtones of the sound being filtered, those overtones are reinforced. This gives the filter a character that can sound vocal, buzzy or zappy, depending on how it's used. When the resonance is turned up past about 3 o'clock on the analog edit dial, the filter begins to self-oscillate at the cutoff frequency, producing a sine wave tone.



Frequency response of a Lowpass filter with Resonance

Other filter section controls include Keyboard Amount (KB AMOUNT), Envelope Generator Amount (EGR AMNT) and OVERLOAD.

The KB AMOUNT parameter allows you to set the degree to which the filter cutoff frequency tracks the note that is played. For example, when the KB AMOUNT is set to it's highest level (100%), the filter cutoff will rise by an octave each time you play an octave higher on the keyboard. This setting allows you to maintain a consistent filter tone regardless of whether you play low or high on the keyboard. When the KB AMOUNT is set to zero, the filter cutoff remains at the value determined by the analog edit control, regardless of where you play on the keyboard. This can make the sound less bright as you play higher up on the keyboard. The KB AMOUNT parameter includes the keyboard GLIDE control signal, which allows the filter cutoff to follow the glide of the notes being played (when GLIDE is switched ON). Using the KB AMOUNT control, you can adjust the amount of Glide that will affect the filter cutoff.

The EGR AMNT parameter allows you to set the degree to which the Filter EG affects the filter cutoff frequency. The EGR AMNT parameter is bi-polar, meaning the Filter EG can affect the filter cutoff either in a positive or negative way. A positive amount will cause the Filter EG to raise the cutoff frequency, while a negative amount will cause the Filter EG to lower the cutoff.

Finally, the OVERLOAD parameter allows you to set the amount of signal clipping from none to soft to hard clipping as the amount is increased. The results you get with OVERLOAD will depend on the settings of the oscillator waves and levels, and the filter cutoff and the filter resonance settings in addition to Overload amount. Overload is not the same distortion you'd get from a fuzz box – it must be played with to get the best results. It can be quite subtly applied to add just a touch of 'bite', or aggressively applied to add a jagged edginess to the sound.

Filter Section controls:

Cutoff:
When the **CUTOFF** switch is selected, the analog edit control is used to adjust the filter cutoff frequency. The cutoff frequency is adjustable from about 20 Hz to 16 Khz. As the edit control is rotated clockwise, the cutoff frequency is increased, allowing more of the signal harmonics to pass through the filter.

Resonance:
When the **RESONANCE** switch is selected, the analog edit control is used to adjust the filter resonance. Resonance causes feedback in the filter circuit, adding harmonic emphasis at the cutoff frequency. When the Resonance control is all the way down, the lowpass filter acts basically as a tone control, rolling off the high end of the signal as the Cutoff control is turned down. As Resonance is increased, the filter begins to form a peak at the cutoff frequency. This emphasizes harmonics near the cutoff frequency, and can result in a 'wah-wah' effect when resonance is set fairly high and the filter cutoff is varied. As the resonance is turned up the peak increases in strength until it begins to self-oscillate – creating a sine wave with the same frequency as the cutoff frequency.

Keyboard Control Amount (KB AMOUNT):
When the **KB AMOUNT** switch is selected, the analog edit control is used to adjust the amount of post-glide keyboard voltage that is routed to the filter cutoff frequency. When the edit control is rotated fully clockwise, the filter cutoff follows the key played on the keyboard. A higher key will cause a higher cutoff frequency. This allows a sound to retain its brightness as it is played higher on the keyboard.

Envelope Generator Amount (EGR AMNT):
When the **EGR AMNT** switch is selected, the analog edit control adjusts the amount of the Filter Envelope Generator output that affects the filter cutoff. The Envelope Generator Amount is bi-polar, as indicated by the legend on the panel, so the amount is 0 when the edit control dial is at the 12 o'clock position. Rotating the control CW from that point adds a positive EG amount to the filter cutoff, while rotating the control CCW from that point adds a negative amount to the filter cutoff.

Overload:
When the **OVERLOAD** switch is selected, the analog edit control adjusts the amount of pre-filter and post-filter clipping. Overload can be used to warm up sounds and give them a distinctive tonal edge. Advancing the edit control increases the amount of clipping from the subtle warmth of soft clipping to the 'growl' provided by the beginnings of hard clipping. When set to 100%, Overload adds a volume boost of about +6dB.

Additional CV control:
The **FILTER** jack on the side-panel is a CV input for external control of the filter cutoff parameter. The jack accepts -5 to +5 volts, or an expression pedal like the EP-2. A voltage applied to this jack is added to the setting of the filter cutoff control. A one-volt change in the control voltage will change the cutoff frequency of the filter by about one octave.

TECH NOTES:

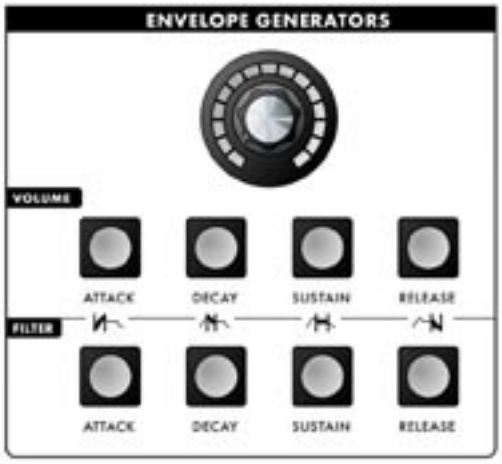
1. The LP's Overload circuit uses asymmetrical clipping, which clips each side of the waveform differently. Asymmetrical clipping circuits tend to produce tones with unique richness and character.

2. The Overload circuit has no effect on the sound when the analog edit control is set fully counter-clockwise. Advancing the control gradually introduces the effect, starting with a gentle overdrive-like quality that becomes increasingly aggressive and edgy as the control reaches 100%. Because the Overload uses clipping, some sounds, such as a square wave with the filter cutoff all the way up, aren't affected much by increasing the Overload amount. Try sounds tuned to intervals other than unison, and a slightly resonant filter setting to really hear the effect.

3. The name "Overload" came from the Overload indicator on the Minimoog, where if the output was patched back into the audio input the Overload indicator would go on. Mixing the Audio in would provide a "fatter" sound by increasing the level of signal coming out of the mixer and going into the filter.

C. The Envelope Generators Section

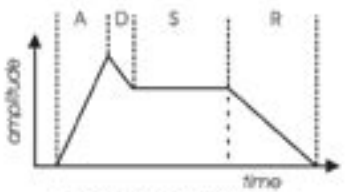
Musical sounds have a start, middle and an end. For example, a plucked string sound starts with an initial burst of energy and then slowly fades out until it is silent. In synthesis terms, this progression is called an envelope – a shape that defines the changes that occur in a sound over time. An envelope can define any aspect of change in a sound – volume, timbre, or pitch. The circuits that create envelope control signals in synthesizers are called Envelope Generators (EGs).



The Little Phatty has two identical EG circuits. When triggered, these circuits produce time-varying control voltages having a start, middle and an end. The parameters that specify this progression are the Attack, Decay, Sustain and Release controls, sometimes abbreviated as ADSR.

Attack determines the character of the onset of the sound. The Attack control adjusts the time it takes when a key is pressed for the envelope to go from 0 to full value (the fade-in time). The Decay control adjusts the second stage in the evolution of a sound before it sustains or dies out. Decay is the time that it takes for the signal to drop from the full level to the level set by the Sustain control. The envelope will stay at the sustain level as long as a key is held down. When the key is released, the Release control determines how long it takes for the sound to fade out (see ADSR Envelope Signal below).

The Little Phatty has one EG dedicated to the filter (to control the cutoff frequency), and one EG dedicated to the amplifier (to control the volume). The Filter EG can also be used as a modulation source through the Modulation Matrix.



ADSR Envelope Signal

Envelope Generator Section Controls:

Attack:
When the **ATTACK** switch is selected, the analog edit control is used to adjust the Attack time of the corresponding envelope from 1 msec to 10 seconds.

Decay:
When the **DECAY** switch is selected, the analog edit control is used to adjust the Decay time of the corresponding envelope from 1 msec to 10 seconds.

Sustain:
When the **SUSTAIN** switch is selected, the analog edit control is used to set the Sustain level of the corresponding envelope.

Release:
When the **RELEASE** switch is selected, the analog edit control is used to adjust the Release time (the time for the envelope to return to zero) from 1 msec to 10 seconds.

Additional Control:
The **KB GATE** jack on the side panel is a trigger input that accepts a footswitch (momentary, normally closed like the Moog FS-1) or a gate signal. Pressing the footswitch or applying a gate signal (+5V) causes both envelopes (Volume and Filter) to trigger.

PERFORMANCE TIP: Plugging a FS-1 footswitch into the KB GATE jack allows you to trigger or sustain a note using your foot without playing the keyboard – useful if you want to free-up both hands to modify two panel functions at once.

D. The Modulation Section

Modulation is the heart of making interesting sounds with analog subtractive synthesis. The LP's Modulation section opens up a world of modulation possibilities that were not available on the original Minimoog. The Modulation section allows you to select from six modulation sources, four destinations, and set the modulation amount. The output of the Modulation section is controlled by the Modulation Wheel.

To try out a simple modulation effect, make the following settings:

- Set the LFO RATE to 6 Hz (about 11 o'clock on the analog edit control)
- Set the SOURCE to Triangle wave
- Set the DESTINATION to Pitch
- Set the AMOUNT to 50% (about 10 o'clock on the analog edit control)

These settings will produce a vibrato effect with variable depth when the Modulation Wheel is pushed forward.

Section Controls:

LFO Rate:
When the **LFO RATE** switch is selected, the analog edit control is used to adjust the frequency of the LFO. The frequency is adjustable from 0.2 Hz to 500 Hz. Since the LFO rate extends well into the audio range, this allows the LFO to be used for clangorous (FM-like) modulations.

Amount:
When the **AMOUNT** switch is selected, the analog edit control is used to adjust the maximum amount of modulation sent to the Mod Wheel.

Source:
The **SOURCE** switch selects the source of the modulation. Each time the switch is pressed, it advances to the next modulation source, as indicated by the corresponding LED. Four of the selections allow you to use the LFO as a modulation source. When any of the LFO waves is selected, the associated LED will flash in time with the LFO rate. The available Source selections are:

- LFO Sawtooth Wave
- LFO Square Wave
- LFO Triangle Wave
- LFO Ramp Wave
- Filt. Env. (Filter Envelope)/Sample & Hold
- Osc 2 (Oscillator 2)/Noise

Destination:
The **DESTINATION** switch selects the destination of the modulation. The modulation destination is chosen in the same manner as the source. The modulation destination selections are:

- Filter (affects filter cutoff)
- Pitch (affects the pitch of both oscillators)
- Wave (affects the waveform of both oscillators)
- Osc 2 (affects the pitch of Oscillator 2)

E. The Output Section

The Little Phatty has a single monophonic audio output. The level of the audio output is adjusted by the Volume Control. An On/Off switch allows you to turn off the output signal while keeping the Headphone signal active.

Section Controls:

Volume:
VOLUME is the main volume control. Rotating the control fully clockwise produces the maximum output. Rotating the control fully counterclockwise silences the Little Phatty. The VOLUME control setting is not stored with the preset.

Output On/Off:
The **OUTPUT ON/OFF** switch controls the audio that appears at the audio output jack. This switch has no effect on the Headphone jack. This arrangement allows you to monitor and adjust the sound of the LP using headphones, while silencing the signal at the Output jack. You can also use the **OUTPUT ON/OFF** switch to turn off the output if you are using the LP as a controller and wish to control external gear without hearing the LP. The output is ON when the switch is lit..

Headphone Jack:
The **HEADPHONE** jack is a ¼" TRS headphone output for use with standard headphones. The Volume control adjusts the level at this jack.

PERFORMANCE TIP: The headphone volume can be scaled using the System Utilities 'HP Volume' menu (see page 44) in order to match the sensitivity of your headphones and your desired Output Volume setting.

Additional CV control:
The **VOLUME** jack on the side panel is a CV input for external control of the Output level. The jack accepts a positive control voltage from 0 to 5 Volts, or an expression pedal like the Moog EP-2. A voltage of 0 volts silences the LP, and a voltage of 5 volts corresponds to the output level set by the **VOLUME** control knob.

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F. Keyboard and Left-Hand Controllers

The Little Phatty has a 37-note keyboard (3 octaves, C to C). When combined with the **OCTAVE** buttons, the keyboard has a playable range of 7 octaves. The keyboard produces velocity control voltages and transmits MIDI Note On and Note Off messages polyphonically. To the left of the keyboard is the Left Hand Controller Panel, which contain the Pitch Bend and Mod Wheel controls.

Pitch Bend Wheel:
This spring-loaded control affects the pitch of both oscillators. The amount of pitch bend can be set for each direction (UP/DOWN) independently via the Advanced Preset Menu (see page 35) and saved in each preset.

Modulation Wheel:
This control sets the amount of modulation that is sent to the modulation destination of the Modulation Matrix. Each preset has the Modulation Wheel programmed to introduce some additional dimension to the sound. As you explore the presets, don't forget to try the Modulation Wheel to hear this added effect on the sound.

PERFORMANCE TIP: The expressive use of the Pitch Bend and Modulation Wheels is the key to breathing musical life into your performances. For example, a small amount of pitch bend (a few semi-tones) will allow you to easily perform guitar-like bends, while a large amount can be useful for extreme 'dive bomb' pitch effects. The Mod Wheel can be programmed to introduce standard modulation effects like vibrato, tremolo or filter sweeps, or it can control something less expected, like EG-swept oscillator sync. Although the actual performance technique with these controls is beyond the scope of this manual, we recommend listening to recordings of synthesizer players, guitarists and other soloists to learn the various ways these controls can be used effectively.

G. Input/Output Panel

The Side Panel provides all of the input and output connections. In addition to Audio Input/Output jacks, there are CV and Gate inputs, connections for MIDI, and the power connector and power switch.

Power Connector:
This is a standard AC power inlet, Use only a power cord designed to mate with this receptacle. The Little Phatty's built-in universal power supply is designed to work with power inputs of 90-250 Volts AC, 50/60 Hz.

IMPORTANT SAFETY NOTE – Do not alter the power connector in any way. Doing so can result in the risk of shock, injury or death. Be familiar with the safety instructions printed at the beginning of this manual. If the connector is damaged, refer servicing to qualified personnel only.

Audio IN:
The Audio In jack allows an external audio source to be mixed with the LP's VCOs, and then routed to the filter for processing. The LP has no provisions for adjusting the level of this input, it must be controlled externally. The audio input is designed to distort as the level of the external audio gets very high, adding color to the sound.

Audio OUT:
The Audio Out jack provides an unbalanced line-level signal for connecting to an amplifier or mixer.

CV Inputs:
The Pitch, Filter and Volume CV jacks supply power and will accept an expression pedal such as the Moogerfooger EP-2 (ring = +5.5 supply to the pedal, tip = variable CV return), or a control voltage from –5 to +5 Volts. The KB Gate Input accepts a footswitch (a momentary, normally-closed footswitch like the Moog FS-1) or a +5 Volt Gate Signal.

MIDI Connectors (DIN and USB):
These are connections for MIDI In/Out. MIDI I/O is configurable for either connection type. For more information on configuring MIDI, see page 31.

PERFORMANCE TIPS:

1. You can use the LP to process any audio signal simply by plugging into the Audio IN jack. To hear the external audio signal without having to hold down a key on the keyboard, plug a dummy plug (or a patch cord with nothing connected to the other end) into the KB Gate jack. This will leave the keyboard gate open, and the volume envelope will remain at its Sustain level until the keyboard gate closes. Due to the design of the envelope circuits, you will need to turn the envelope Decay parameter down below 12:00 in order for the Sustain level to remain constant. If you notice that the volume of the external signal begins to slowly fade away, check to be sure the envelope Decay parameters are not set too high.

2. The LP's Audio Input is not limited to processing monophonic signals - it can work well for processing polyphonic signals, too. For example, connect the MIDI Out of the LP to the MIDI Input of another polyphonic keyboard, then feed that audio output back into the LP through the Audio In jack. Now you have a POLYPHONIC source that is being affected by the LP's Filter, Overload and EGR circuits.

H. Interface Panel

The Interface Panel is located on a far left of the instrument. The Interface Panel provides a status display and controls for all of the Little Phatty's software functions and instrument settings.

The status display is an LCD screen located in the center of the panel above the section controls. When the LP is first powered on, the screen will display the message:

Little Phatty
Version X.x

The message will stay on the screen for a few seconds, and then the screen will display the active preset. This preset will be the last preset in use when the Little Phatty was powered down.

Section Controls:

Master:
Pressing the **MASTER** switch places you in Master mode. In this mode, the **VALUE** knob is used to scroll through the Master mode menus for the Little Phatty. For a list of the Master mode menus, see page 26.

Preset:
Pressing the **PRESET** switch places you in Preset mode. In this mode, the **VALUE** knob is used to select the preset. The **PRESET** switch also functions as 'compare' button, allowing you to toggle between stored and edited presets. For more on Preset Mode, see page 23.

Value:
The **VALUE** knob is a continuous rotary encoder used to access menus and options, and select presets. Depending on the selected parameter, the **VALUE** knob will adjust numeric values UP or DOWN, or toggle amongst discrete options. The encoder has a built-in push button (called the **VALUE** pushswitch) that is used to advance through the presets in Performance Sets and for stepping though Master menu submenus. When naming a preset, the **VALUE** pushswitch will advance the cursor to the next letter.

Cursor:
The **CURSOR** switch is used to navigate around the display. In Master mode, the cursor is used to advance through the parameters in the display, allowing you to make edits and changes. In Preset Mode, the cursor is used to enter the Preset naming operation. Press **CURSOR** to get into cursor mode, and press **MASTER** or **PRESET** to exit cursor mode.

Enter/Store:
The **ENTER/STORE** button is used to enter changes and store edited presets in PRESET mode and to execute SysEx and System Utility functions in MASTER mode.

Fine Tune:
The **FINE TUNE** control is used to tune the Little Phatty's oscillators ±3 semitones for matching an external reference pitch.

Glide On/Off:
The **GLIDE ON/OFF** switch enables or disables the glissando effect between notes. Glide is ON when the switch LED is lit. The glide rate is set using the **GLIDE RATE** control in the oscillator section.

Octave Up/Down:
The **OCTAVE UP** and **OCTAVE DOWN** switches affect the octave selection for both oscillators. The range is –2, -1, 0, +1, +2. Pressing either switch once will light the switch amber and adjust the octave accordingly. Pressing the same switch a second time will adjust the octave again and change the illumination from amber to red, indicating that a two-octave change has been selected. The Octave settings are stored individually for each preset.

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Preset Mode

Preset mode is the default mode when the LP is powered on. Preset Mode is used to access presets and provide control for editing, naming and storing sounds.

Preset sounds are selected using the **VALUE** knob. As the **VALUE** knob is advanced, the next preset appears in the display and is immediately available to be auditioned (you do not need to 'activate' the preset to hear it). Pressing **VALUE** and turning the knob will advance by increments of ten.

You can use the front panel controls to edit the sound at any point. Changing any of the front panel controls will automatically switch the lower part of the display from 'PRESET ACTIVE' to 'PANEL ACTIVE', indicating that the preset has been modified. The **PRESET** light also changes its illumination from amber to red, indicating that the sound you hear is an edited version of the stored preset

You can toggle between the stored and edited sound by pressing the **PRESET** button. This acts like a COMPARE function, allowing you to compare the sound of the original and edited presets. When using the COMPARE function, the **PRESET** button will alternate colors and the LCD will display either 'PRESET ACTIVE' (the original sound) or 'PANEL ACTIVE' (the edited sound).

NOTE: When switching between Master and Preset modes, the last used preset appears in the display.

Storing Presets

To store a preset, press the **ENTER** button. This button doubles as the **STORE** button in Preset mode as indicated on the front panel. Store is used to save an edited preset (Panel Active), or to change the location of a stored preset (Preset Active).

When you press **STORE**, the LCD will display a message similar to the one shown at left. The top line shows the location where the preset will be saved, and the name of the preset that is currently stored in that location. Use the **VALUE** knob to change to the desired preset location, then press the **CURSOR** to move the cursor to the lower line of the LCD. A default setting of 'OVERWRITE: NO' as shown protects you from accidently overwriting a favorite preset. If you decide that you do not want to save the preset, press **ENTER** and the LP will return to Panel Mode without saving.

If you are sure you want to save the preset to the selected location, use the **VALUE** knob to select 'OVERWRITE:YES' and press **ENTER**. The LP will display the 'PRESET STORED' message confirming that your preset was saved successfully.

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NOTE: When the Arpeggiator is running, the ENTER/STORE button is also used to activate the latch *if* the Latch parameter has been enabled. For more on the Arpeggiator and Latch functions, see page 39.

Changing A Preset Name

Changing a preset name is a simple operation. The characters in a name are individually selected by moving the cursor to the desired location and scrolling through the character list. To change a preset name, press the **CURSOR** button until it advances to the first letter of the name. Use the **VALUE** knob to select the desired character or number. Press the **VALUE** pushswitch to advance the cursor to the next letter. Repeat this action until all desired characters have been changed.

Preset names consist of any combination of 13 letters, numbers and punctuation characters. In order, the available characters are:

(space) A B C D E F G H I J K L M N O P Q R S T U V W X Y Z 0 1 2 3 4 5
6 7 8 9 a b c d e f g h i j k l m n o p q r s t u v w x y z ! # $ % & ( ) * ? @

Press the **CURSOR** button once to select the first character in the name as shown.

Use the **VALUE** knob to select a new character as shown. Use the **VALUE** pushswitch to advance to the next character, then use the **VALUE** knob to select the next character. Continue in this manner until the desired name change is complete. When finished, press the **STORE** button to enter the name change into memory. Select the desired memory location, select 'OVERWRITE:YES', and press **STORE** to save the new name,

PERFORMANCE TIP: When a preset is stored, the 'ON' status of the active parameter in each of the four sections is also stored. For example, if Cutoff was the active filter parameter when the preset was stored, it will become the active filter parameter again when the preset is recalled. By saving your presets with this in mind, you can have the four analog edit controls automatically set to the desired parameters when the preset is recalled. This is a great feature if you need to tweak the sound in live performance!

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Tap Tempo

Tap Tempo is an easy and intuitive way to adjust the speed of the LFO Rate or the Arpeggiator Clock. The Tap Tempo function is always available for any preset in PRESET Mode. Tap Tempo can be used to adjust the LFO Rate when the Arpeggiator is not running,, or adjust the Arpeggiator Clock when the Arpeggiator is running.

To enter Tap Tempo Mode, **press and hold** the **LFO RATE** button until it starts flashing rapidly; this indicates that Tap Tempo Mode is active.

When Tap Tempo is active and the Arpeggiator is not running, tapping the **LFO RATE** button will set the internal LFO Rate and override the LFO Sync Mode (see 'LFO SYNC' on page 27). Both the LFO LED and the **LFO RATE** button will begin flashing at the new rate, and the bottom line of the LCD will display a status message indicating that the Tap Tempo function is active:

NOTE: Once activated, Tap Tempo will remain activate even if you change presets. The Tap Tempo rate from the previous preset will not be transferred to the new preset, however.

When Tap Tempo is active and the Arpeggiator is running, tapping the **LFO RATE** button will set the rate of the Arpeggiator Clock. Both the LFO LED and the **LFO RATE** button will begin flashing at the new rate, and the LCD will display the new rate in BPM:

If the **MODULATION** control knob is adjusted while in Tap Tempo Mode, it will override the Tap Tempo and adjust the LFO Rate or Arpeggiator Clock to the new value.

To exit Tap Tempo Mode, **press and hold** the **LFO RATE** button until it stops flashing. This will return to the previous mode (either free running or MIDI clock).

NOTE: If the Arpeggiator is set to 'MIDI CLOCK' when Tap Tempo is active, Tap Tempo will adjust the internal LFO Rate and not the Arpeggiator Clock.

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Master Mode

Master Mode is used to access the global settings and Advanced Preset settings for the Little Phatty, and the routines for sending and receiving data.

To enter master mode, press the **MASTER** button. By default, the first master menu entry is Performance Sets. When switching between the Master and Preset modes, the last used master menu entry appears.

When the master menu is active, the **VALUE** knob is used to scroll through menu entries. To change a particular menu entry, you must hit the **CURSOR** button to enable the parameter for editing. The selected parameter will be underlined, indicating that this parameter value can now be changed. The **VALUE** knob is now used to change the parameter value(s). The chosen parameter is automatically changed as the display is updated (i.e. if you scroll through values and settle on something new, you don't have to do anything to activate that new entry). If a menu contains more than one parameter for editing, repeatedly pressing **CURSOR** will step through the available parameters. Press the **MASTER** button at any time to return to Master Mode.

A. Master Mode Menus

Descriptions of each individual Master Mode menu appears below. A chart displaying the full Master Mode Menu 'tree' appears in Appendix A.

PERFORMANCE SETS:

Performance Sets are collections of preset sounds, pre-arranged for convenient access. There are four banks of Performance Sets containing 8 presets each (32 presets total). You select a bank (1-4) and then set up a sequence of 8 presets in each bank. This allows you to easily switch between these assigned presets in the order they are set up. Once you have your performance bank set up, you can step sequentially through the bank by pressing the **VALUE** switch, or use the **CURSOR** button to highlight the bank or preset, then use the **VALUE** knob to make the change.

In the example menu shown here, the 3rd preset in Performance Set 1 is Preset 24 - LEAD. For more on Performance Sets and how to configure them, see page 50.

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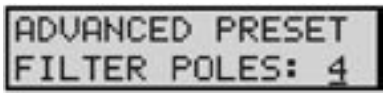
ADVANCED PRESET:



Advanced Presets is a set of menus that allows you to access additional parameters for the selected preset. These parameters are stored individually for each preset. There are eleven Advanced Preset menus:

- Filter Poles
- EGR Release
- Gate Trigger Options
- Filter Sensitivity
- Additional LFO Modulation Sources (SRC5 & SRC6)
- Pitch Bend
- Secondary Modulation destinations.
- Keyboard Priority
- Pot Mapping
- Arpeggiator

For more information, see the *Advanced Preset Menus* section on page 35.

LFO SYNC:

The LFO Sync menu allows you to globally set the LFO to Internal (free-running) or MIDI Clock. When set to 'INTERNAL', the **MODULATION** control is used to set the rate of the LFO. When set to 'MIDI CLOCK', the LFO rate is controlled by an external MIDI Clock and the selected Clock Divider settings (see below). To change the LFO Sync Mode, use the **CURSOR** button to move to the selection field and use the **VALUE** knob to select the mode.

Modes: INTERNAL, MIDI CLOCK; the default is INTERNAL

NOTE: For additional information, see *Appendix B – LFO Sync Modes*

When the LFO Sync Mode is set to 'MIDI CLOCK', you can program the clock divider to one of 15 different values. The divisor is based on 24 clocks per quarter note (the MIDI standard). The table on the following page shows how the number of MIDI clocks relates to musical time values. When the LFO Sync Mode is 'CLOCK', the **MODULATION** control can be used to select the clock divider (the 15 divider values correspond to the 15 LEDs in the **MODULATION** control light-pipe). The default clock divider value is 1/4 (= 24 clocks/quarter note).

PERFORMANCE TIP: You can adjust the clock divider value in real time - this is a great way to add rhythmic variations to a performance. For example, try some deep filter modulation using a clocked triangle LFO while adjusting the divider for some cool rhythmic fun!

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CLOCKS/QUARTER NOTE	TIME VALUE	LP DISPLAY
3	1/32 note	1/32
4	Dotted 1/32 note	1/32 DOT
6	1/16 note	1/16
9	Dotted 1/16 note	1/16 DOT
12	1/8 note	1/8
18	Dotted 1/8 note	1/8 DOT
24	**Quarter note**	**1/4**
36	Dotted quarter note	1/4 DOT
48	Half note	1/2
72	Dotted half note	1/2 DOT
96	Whole note	WH
128	Whole note + quarter note	WH + 1/4
144	Whole note + half note	WH + 1/2
168	Whole note + dotted half note	WH + 1/2 DOT
192	Whole note + whole note	WH + WH

MIDI Clock Divider values

ANALOGUE MODE:

Analogue mode controls the way the analog edit controls work. In SNAP mode, the parameter will 'snap' instantaneously to the current potentiometer setting. In PASS-THRU mode, the parameter value stays constant until the potentiometer passes through the current value. In TRACK mode, the parameter value moves in the same direction as the knob is rotated (left or right) until the value and knob position are identical. To change modes, use the **CURSOR** button to highlight the parameter, then use the **VALUE** knob to set the new parameter value.

Values: PASS-THRU, SNAP, TRACK; the default value is Track

KEYBOARD PRIORITY:

The Keyboard Priority menu allows you to select from 3 different types of keyboard priority. Keyboard priority for a monophonic instrument determines what happens when more than one key is pressed. A setting of LOW NOTE causes the lowest key pressed to sound, a setting of HIGH NOTE causes the highest key pressed to sound, and a setting of LAST NOTE causes the most recent key pressed to sound. To change the keyboard priority, use the **CURSOR** button to highlight the parameter, then use the **VALUE** knob to set the new parameter value.

Values: LOW NOTE, HIGH NOTE, LAST NOTE;
the default is LAST NOTE

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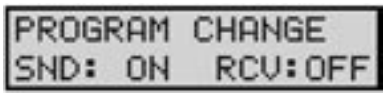
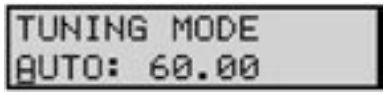
PROGRAM CHANGE SEND/RECEIVE:



This menu item is used to enable or disable the transmission (SND) and reception (RCV) of MIDI program changes. To change the status of either parameter use the **CURSOR** button to highlight the parameter, then use the **VALUE** knob to set the new parameter value.

Values: ON, OFF;
the default values are ON for both SND and RCV

TUNING



The Tune parameter is used to enable or disable the **FINE TUNE** panel control (ON/OFF), or enable the AutoTune function (AUTO).

When the Tune parameter is set to ON, the **FINE TUNE** panel control is used to tune the LP. In this mode, you can use the **VALUE** knob get very precise tuning control by moving the display cursor over to the numerical value and rotating the **VALUE** knob (the adjustment value is from -1024 to +1023, representing roughly ± a third).

When the Tune parameter is set to OFF, the position of the **FINE TUNE** panel control is stored and the control itself is disabled. This feature prevents accidental bumping of the **FINE TUNE** panel control during performance.

When the Tune parameter is set to AUTO, the AutoTune function is engaged and the display changes as shown. AutoTune works to keep the LP in tune by automatically making fine adjustments to the Fine Tuning CV.

When AutoTune is enabled, the display shows the actual value of the last note played (displayed as the MIDI note number, shown here as '60'), and the current tuning value (displayed in cents, shown here as '.00'). In this mode, the LP will continually tune to this value. To adjust the note that you are tuning to, cursor over to the Note value in the display and use the **VALUE** knob for precise adjustments. Hitting another note on the keyboard will set that note as the new target for tuning. You can exit out this menu by hitting the **MASTER** or **PRESET** buttons, and the LP will remain in the AutoTune mode, maintaining the current tuning.

Values: ON, OFF, AUTO; the default is ON

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NOTE: While you are in this menu with AutoTune enabled, the output of the LP will be muted (the **Output ON/OFF** button status will not change, however). The reason for muting the output is that AutoTune uses a special Calibration Preset tone which isn't very musical. The LP's output will remain muted as long as you stay in this menu, or until you disable AutoTune. If AutoTune is active when you leave the menu, it will remain active but will automatically unmute the output and disengage when you start playing. AutoTune has a special 'timeout' feature that waits 15 seconds after you stop playing before engaging the AutoTune function in the background. If the AutoTune menu is displayed during this time, you will see it change:

AUTO …

Until the timeout is finished, at which point, the target note will appear again:

AUTO 60.12

The LP will continue to autotune while you are playing until you disable it in the menu, or until you switch off the power.

For more on the Calibration Preset and a list of its parameter values, see Appendix D.

PRECISION MODE:

Precision Mode is a feature that allows precision editing of LP parameters using the **VALUE** knob. Each LP parameter stored has a value from zero to 4095. In Precision Mode that value is displayed on the second line on the screen.

To edit a parameter in Precision Mode, press the corresponding parameter button on the front panel (for example, Filter Cutoff). You will see that parameter name along with its value on the display. To edit with the **VALUE** knob, press the **CURSOR** button and rotate the **VALUE** knob. Each click of the **VALUE** knob results in a change of one value. Pressing the **VALUE** knob while simultaneously rotating it will change the value in increments of 10, allowing for faster editing.

Changes made to a preset in Precision Mode are part of the current Panel Active edited sound. To make these changes permanent, the preset must be stored (see "Preset Mode" on page 23). To exit Precision Mode, press the **MASTER** or **PANEL** button. The last edited parameter in Precision Mode will be remembered until it is changed in Precision Mode or the unit is powered down.

Values: The default parameter is Volume Attack

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MIDI CHANNELS IN AND OUT:

This menu is used to select the LP's MIDI In and Out channels. The LP can only send and receive on one channel at a time, but each channel can be set independently. To change the MIDI channel, use the **CURSOR** button to highlight the desired parameter, then use the **VALUE** knob to select the new parameter value.

Values: OFF, 1 – 16;
the default values are 1 for both MIDI In and MIDI Out

MIDI SETUP:

The MIDI SETUP menu is used to select the LP's MIDI options. There are seven pages of MIDI menus, beginning with the 'ALL NOTES OFF' menu. This menu allows you to issue an 'All Notes Off' message to the MIDI output, shutting off all active notes on the LP and/or any attached MIDI tone modules or keyboards. This command is the equivalent of a MIDI panic button to silence stuck notes. To issue the command, simply press the **ENTER** button (you do not have to enable this menu with the **CURSOR** button).

The second page of the MIDI Setup menu allows you to turn control of the LP's synth engine ON or OFF locally, i.e. the keyboard, wheels, and any front panel controls that can also receive MIDI. It does not disable any MIDI transmitting or receiving. A setting of 'OFF' will prevent double triggering in the event you are using a MIDI sequencer with both the MIDI IN and MIDI OUT connected, and the sequencer is echoing MIDI data back to the LP. To change the Local Control setting, use the **CURSOR** button to highlight the control value, then use the **VALUE** knob to change the setting.

Values: ON, OFF; the default is ON

The third page of the MIDI Setup menu allows you to select the MIDI input connection. Since the LP Stage II offers both MIDI DIN and USB connections, several input options are possible. To specify the MIDI input connection, use the **CURSOR** button to highlight the input selection, then use the **VALUE** knob to select the desired input.

Values: NONE, DIN, USB, DIN/USB; the default is DIN/USB

TECH NOTE: 'DIN' is an abbreviation for 'Deutsches Institut für Normung' (German Institute for Standardization). 'DIN connectors' commonly refer to a family of circular connectors that were standardized by the DIN for commercial electronic use. When the MIDI standard was released in 1983, it specified a 5-pin DIN connector as the hardware interconnection, thus the 'MIDI DIN' connector.

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MIDI SETUP (con't)

The fourth page of the MIDI Setup menu allows you to select the MIDI output connection. To specify the MIDI output connection, use the **CURSOR** button to highlight the output selection, then use the **VALUE** knob to select the new output.

Values: NONE, DIN, USB, DIN/USB; the default is DIN/USB

The fifth page of the MIDI Setup menu allows you to select the routing of the MIDI Merge function for the USB input. When MIDI Merge is ON, the LP will echo all MIDI data received at the USB MIDI Input port to the selected MIDI Output port, merged with any MIDI data generated by the LP. This allows you to pass MIDI data thru the LP, even though the LP has no dedicated MIDI Thru connector. To change the selected MIDI output port, use the **CURSOR** to highlight the output parameter, then use the **VALUE** knob to select the desired output.

Values: NONE, DIN OUT, USB OUT, DIN/USB OUT;
the default is NONE.

The sixth page of the MIDI Setup menu allows you to select the routing of the MIDI Merge function for the DIN input. When MIDI Merge is ON, the LP will echo all MIDI data received at the MIDI DIN Input port to the selected MIDI Output port, merged with any MIDI data generated by the LP. To change the selected MIDI output port, use the **CURSOR** to highlight the output parameter, then use the **VALUE** knob to select the desired output.

Values: NONE, DIN OUT, USB OUT, DIN/USB OUT;
the default is NONE.

NOTE: When using MIDI Merge, take precautions to insure that you do not create a MIDI feedback loop (the output is passed back into the input and then merged with the output again), or you may experience unwanted side effects like a locked-up LP. Should this happen, cycling the power should resolve the condition, but it is best not to create a MIDI feedback loop in the first place.

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MIDI SETUP (con't)

The seventh page of the MIDI Setup menu allows you to set up multiple Moog synths as a polyphonic synth stack. The settings are 'POLY: OFF' or 'POLY: (#) of (##)'. The first number represents which note this particular LP is assigned to play, the second number sets the total number of available voices. For example, if you had an LP and a Voyager RME, you would set the LP to 'POLY: 1 of 2'; on the Voyager RME you would go to 'MIDI Key Order' on the Master menu and set the RME to be note 2 of 2 (note that your Voyager must also have the latest firmware installed; the current Voyager OS is version 3.3). Connect the MIDI OUT from the LP to the MIDI IN on the Voyager. You should now be able to play duophonically, with the LP sounding the first note played on the keyboard and the Voyager RME sounding the second note. If all available voices are in use, additional notes will not sound until enough keys are released to free a voice. MIDI Continuous Control numbers (MIDI CC's) are consistent between the Voyager and Little Phatty, so any parameter changes such as pitch bend and mod wheel, filter cutoff and so on, should affect all voices simultaneously.

If you have two Little Phatty synths, you would connect MIDI OUT from the first one to MIDI IN on the second, then you would turn on MIDI MERGE on the second LP and connect its MIDI OUT to the MIDI IN on the first LP. Turn off LOCAL CONTROL on the first LP so that it is controlled only by the MIDI data that is shared between the two synths.

If you have more than two Moog synths, connect them so that MIDI passes through each synth and the last is connected to the first; but make sure that the first synth does NOT pass MIDI through to the next, or you will create a MIDI feedback loop. The "first synth" in this description should always be the one on which you are playing the keys. If the first synth is an LP, make sure MIDI MERGE is turned OFF on this synth. If the first synth is a Voyager, make sure that you are connecting MIDI OUT from it to the MIDI IN on the second synth; do not use the MIDI THRU jack on the first synth, only on subsequent synths (voice 2 or higher).

NOTE: When the Arpeggiator is activated, it overrides any POLY mode settings.

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SYSEX MENU:

SysEx (System Exclusive) is a set of commands to transmit and receive selected presets, bulk dumps and firmware dumps. For more information on SysEx commands, see the *SysEx Menus* section on page 41.

SYSTEM UTILITIES:

System Utilities is a set of commands used to perform a system reboot, restore factory default values or perform various system calibrations on the instrument. For more information, see the *System Utilities Menus* section on page 44.

PERFORMANCE TIP: You can quickly change a Master Menu parameter during performance by first entering Master Mode and select the desired parameter menu using the VALUE knob, then return to Preset Mode. When you are ready to make the change, press MASTER. The desired menu item will be displayed, allowing you to quickly make adjustments.

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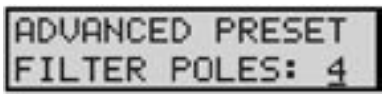
B. Advanced Preset menus

The Advanced Preset menu provides a set of additional programming parameters for each preset. These parameters are stored individually for each preset.

FILTER POLES:



This menu allows you choose the number of Filter Poles for the preset. The number of Filter Poles specifies the filter response, from a gentle 6db/octave (1 pole) to a steep 24db/octave (4 poles). To select the number of Filter Poles, use the **CURSOR** button to highlight the parameter, then use the **VALUE** knob to set the new parameter value.

Values: 1, 2, 3, 4

EGR RELEASE:

This menu allows you to turn the EGR Release parameter ON and OFF. EGR Release is used to enable or disable the Release segment of both the filter and volume envelopes. To change the status, use the **CURSOR** button to highlight the parameter, then use the **VALUE** knob to set the new parameter value.

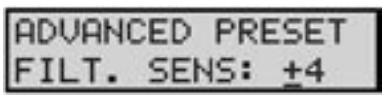
Values: ON, OFF

GATE:

The Gate menu allows you to select how the envelopes are triggered when more than one key is pressed on the keyboard. A setting of LEG ON (Legato ON) means that the envelopes aren't retriggered until the key is fully released. A setting of LEG OFF (Legato OFF) will retrigger the envelope on a new note from the current EGR level. A setting of EGR RESET will force the envelope generators to start from 0 volts each time a note is triggered. To change the Gate mode, use the **CURSOR** button to highlight the parameter, then use the **VALUE** knob to set the new parameter value.

Values: LEG ON, LEG OFF, EGR RESET

FILTER SENSITIVITY (FILT. SENS):



The Filter Sensitivity menu allows you to select how the keyboard velocity will affect the filter cutoff frequency. Positive values increase the velocity sensitivity. This will raise the filter cutoff as the keys are struck harder, mimicking the properties of acoustic instruments. Negative values will have the opposite effect, lowering the filter cutoff frequency as the keys are struck harder. To change the parameter, use the **CURSOR** button to highlight the parameter, then use the **VALUE** knob to set the new parameter value.

Values: -8... 0... +8

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MOD SOURCE 5 (MOD SRC 5):

This menu allows you to select one of two modulation options that will be used when the FILT ENV source is selected on the front panel (Modulation Source 5). FILT (Filter Envelope) is the default source, but S-H (Sample & Hold) can be chosen as an alternate. To change the parameter, use the **CURSOR** button to highlight the parameter, then use the **VALUE** knob to set the new parameter value.

Values: FILT, S-H

MOD SOURCE 6 (MOD SRC 6):

This menu allows you to select one of two modulation options that will be used when the OSC2 source is selected on the front panel (Modulation Source 6). OSC2 (Oscillator 2) is the default source, but Noise can be chosen as an alternate. To change the parameter, use the **CURSOR** button to highlight the parameter, then use the **VALUE** knob to set the new parameter value.

Values: OSC2, NOISE

MODULATION DESTINATION 2 (MOD DEST2):

This menu allows you to program a secondary destination for modulation. The four destination options here are the same as those offered on the front panel (the primary modulation). The Modulation **AMOUNT** control specifies both the primary and secondary modulation amounts - there is no separate amount control for the secondary modulation. To program a secondary modulation destination, use the **CURSOR** button to highlight the destination parameter, then use the **VALUE** knob to set the new parameter value.

Values: OFF, PITCH, FILTER, WAVE, OSC2

PITCH BEND (PB):

The Pitch Bend menu allows you to individually set the positive and negative ranges for the Pitch Wheel. The settings are specified in semitones. To change either parameter, use the **CURSOR** button to highlight the parameter, then use the **VALUE** knob to select the new parameter value.

Values: UP: 0, +2, +3, +4, +5, +7, +12
DN: 0, -2, -3, -4, -5, -7, -12

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KEYBOARD PRIORITY (KB PRIOR):

The Keyboard Priority menu allows you to select the keyboard priority for individual presets. The default is GLOB (Global), which inherits the global keyboard priority setting from the Master KEYBD PRIORITY menu, but this can be changed to low note, high note or last note priority. To make a change, use the **CURSOR** to move to the priority parameter field, then use the **VALUE** knob to select the desired value.

Values: GLOB, LOW, HIGH, LAST; the default value is GLOB

POT MAPPING:

The Pot Mapping menu allows you to make arbitrary MIDI Continuous Controller (CC) assignments to each of the four Analog Edit knobs on the front panel (MOD, OSC, FILT, and EGR). Additionally, the four knobs can be individually programmed to provide internal, external, or combined MIDI control. Among its many possibilities, Pot Mapping allows you to 'reprogram' the four panel knobs to control any of the LP functions. For example, you could program Pot Mapping to give you control of Filter Cutoff, Resonance, Overload and EG Amount, all at the same time.

To set up Pot Mapping, press the **CURSOR** button and use the **VALUE** knob to select the desired control knob (MOD, OSC, FILT, or EGR). Press the **CURSOR** button again to move to the next field and select the desired MIDI CC parameter.

NOTE: When Pot Mapping is enabled for a given panel section, the mapping assignment overrides the normal CC assignments in that section. For example, in the Modulation section, the LFO Rate is transmitted as CC#03, and the Amount transmitted as CC #06. If you set up Pot Mapping in the Modulation section to send MIDI CC#21, the Modulation knob will exclusively transmit CC#21 when Pot Mapping is enabled, and not CC#03 or #06. When Pot Mapping is disabled, the Modulation knob will revert to sending the normal MIDI CC's #03 and #06.

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POT MAPPING (con't):

Press the **CURSOR** button once more to select whether the assignment applies to internal only (INT), external only (EXT) or BOTH. Pressing the **CURSOR** button again will return you back to the beginning.

Once programmed, Pot Mapping is enabled in a section by selecting the active parameter in that section. For example, suppose Pot Mapping is configured for the **MODULATION** knob to send MIDI CC#10. To activate Pot Mapping in the Modulation section, press the button that is currently active (i.e. lit) in that section. The button will turn off (no button in the Modulation group will be illuminated); the **MODULATION** knob will now send MIDI CC#10 information when it is adjusted. To disable Pot Mapping in the Modulation section, simply press one of the buttons in that section, and the **MODULATION** knob will return to its normal function.

Values: MIDI CC assignments: OFF, 0-127
Destination: INT, EXT, BOTH

PERFORMANCE TIP: Here's a Pot Mapping example: suppose you have an external audio device that you want to control independently of the LP. You could program Pot Mapping to have the Modulation control transmit MIDI CC #XX, but only have it programmed for external control (EXT). With this setup, you press the active control in the Mod section (either the LFO Rate or Amount switch) to engage Pot Mapping without affecting your LP's sound or state. Now when you adjust the MOD control, it sends MIDI CC #XX out to your external MIDI device, but has no effect on the LP's sound engine.

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ARPEGGIATOR:

The Arpeggiator is exciting addition to the LP's operating system, providing a wide range of musical sequencing possibilities. The Arpeggiator is programmed for each preset individually through the seven menu pages described here. The Arpeggiator is activated from the front panel (see *Activating the Arpeggiator and Latch,* page 52). To enter the Arpeggiator Menu, use the **CURSOR** to highlight 'ARPEGGIATOR' and press **ENTER**.

When you enter the Arpeggiator menu, the top line of the display changes to indicate that you are now programming the Arpeggiator. The first page of the Arpeggiator Menu allows you to enable the arpeggiator function for the chosen preset. When 'ON' is selected, the arpeggiator is 'armed' and ready to be switched on from the front panel. When 'OFF' is chosen, the arpeggiator will remain off, preventing you from switching it on accidently. To change the Enable status, use the **CURSOR** to move to the ON/OFF parameter field, then use the **VALUE** knob to select the desired setting.

The second page of the Arpeggiator menu allows you to select the Arpeggiator Clock Source. There are three possible clock sources:

INT - The Arpeggiator Clock
LFO - The LP's Low Frequency Oscillator
MIDI - An externally applied MIDI Clock

When 'INT' is selected as the clock source, the Arpeggiator runs from its own internal clock. In this mode, when the Arpeggiator is switched ON the Arpeggiator Clock rate is adjusted either with the **MODULATION** knob, or by using the Tap Tempo function, or by issuing a MIDI CC#90 command. Note that you must select the **LFO RATE** switch when the Arpeggiator is ON in order to use the **MODULATION** knob to change the Arpeggiator Clock rate (the **MODULATION** control does not adjust the speed of the LFO when the Arpeggiator is running).

When 'LFO' is selected as the clock source, the Arpeggiator is driven from the Low Frequency Oscillator. In this mode, the **MODULATION** knob adjusts the speed of the Arpeggiator Clock and the LFO Rate together, making it possible to get synchronous, arpeggiated LFO effects.

When 'MIDI' is selected as the clock source, the Arpeggiator is driven from an externally applied MIDI Clock. In this mode, the MIDI Clock synchronizes the Arpeggiator to the sending device (a software DAW, for example). Note that if no MIDI Clock signal is present, the Arpeggiator will not run and no notes will be heard.

NOTE: For additional details, see *Appendix C – Arpeggiator Clock Source*.

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ARPEGGIATOR (Con't):

The third page of the Arpeggiator menu allows you to specify the Arpeggiator Clock Divider. The available Arpeggiator Clock Divider values are the same as the LFO Clock Divider (see table on page 28). To make a selection, use the **CURSOR** button to move to the divider parameter field, then use the **VALUE** knob to select the desired divisor value. The default clock divisor value is '1/4'.

The fourth page of the Arpeggiator menu allows you to select the range of the arpeggiator, specified in octaves. Up to ± 3 octaves can be selected, which allows you to create sequences that are beyond the range of the LP's 3-octave keyboard. To make a selection, use the **CURSOR** button to move to the octave parameter field, then use the **VALUE** knob to select the desired octave value.

Values: -3, -2, -1, 0, 1, 2, 3; the default value is 1.

The fifth page of the Arpeggiator menu allows you to select the order (pattern) in which notes are sequenced. The choices are:

UP - Notes are arpeggiated from lowest to highest
DN - Notes are arpeggiated from highest to lowest
ORDER - Notes are arpeggiated in the order played

To make a selection, use the **CURSOR** button to move to the pattern parameter field, then use the **VALUE** knob to select the desired pattern. The default value is 'UP'.

The sixth page of the Arpeggiator menu allows you to select the Arpeggiator mode. The choices are:

LOOP - When the arpeggiator reaches the end, it loops back to the starting point.
BACK-FORTH - When the Arpeggiator reaches the end it reverses direction and returns to the starting point.
ONCE - The arpeggiator makes a single pass and then stops.

To make a selection, use the **CURSOR** button to move to the mode parameter field, then use the **VALUE** knob to select the desired mode value. The default value is 'LOOP'.

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ARPEGGIATOR (Con't):

The seventh page of the Arpeggiator menu allows you to enable or disable the Latch function. The Latch allows the Arpeggiator to keep repeating the arpeggio state when you remove your hands from the keyboard. The Latch menu arms the Latch function the same way the Arpeggiator ON/OFF menu arms the Arpeggiator. When the Latch parameter is set to 'ON', the Latch can be activated from the front panel (to activate the latch, you must be in PRESET Mode when the Arpeggiator is running - see *Activating the Arpeggiator and Latch* for more). When 'OFF' is selected, the Latch is always off and cannot be activated accidently. To enable/disable the latch function, use the **CURSOR** button to move to the latch parameter field, then use the **VALUE** knob to change the latch status. The default value is 'OFF'.

C. SYSEX (System Exclusive) Menus

SysEx menus are a set of commands to transmit and receive selected presets, bulk dumps and firmware dumps. To enable SysEx menus, press the **CURSOR** button. This will highlight the menu options shown on the second line of the display. Once highlighted, use the **VALUE** knob to scroll through the menus. To activate a command, press the **ENTER** button.

SEND CURRENT PRESET:

This option allows you to send the current preset (system exclusive data format) for archiving a preset in the LP's memory. This requires another LP or computer with a MIDI interface and a program that can accept a SysEx dump. You must enable the device that is to receive the SysEx data. Once the remote device is enabled, press **ENTER** to start the data transfer.

When **ENTER** is pressed, the LCD will briefly display the 'SENDING CUR PRESET' message shown. When the operation is complete, the display will return to the SYSEX menu.

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C. SYSEX Menus (Con't)

SEND ALL PRESETS:

This option allows you to send the system exclusive data for archiving the complete bank of presets in the LP's memory. To complete this command, enable the device that is to receive the SysEx data. Once the remote SysEx device is enabled, press **ENTER** to start the data transfer.

When **ENTER** is pressed, the LCD will briefly display the 'SENDING ALL PRESETS' message shown and the **ENTER** button will stay lit until the data transfer is complete. When the operation has finished, the display will return to the SYSEX menu.

BULK DUMP:

This option allows you to save the entire state of the LP (including all global data, performance set data and preset data) for later recovery. To execute a bulk dump, enable the device that is to receive the SysEx data. Once your remote SysEx device is enabled, press **ENTER** to start the data transfer.

When **ENTER** is pressed, the LCD will briefly display the 'SENDING BULK DATA' message shown and the **ENTER** button will stay lit until the data transfer is complete. When the operation has finished, the display will return to the SYSEX menu.

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Receiving SysEx Data

The LP is able to receive System Exclusive data at any time without any special prior setup. SysEx files are recognized and received automatically when a SysEx data transfer is initiated. The Little Phatty's LCD screen will display the status of SysEx data transfers as follows:

SINGLE PRESETS:

The LP will briefly display a 'RECEIVING SINGLE PRESET' message whenever a single preset is transmitted via SysEx. The preset will automatically be stored at the current preset location. For example, if the current preset location is 31 when the SysEx is received, the new preset data will be written into location 31.

ALL PRESETS:

The LP will display a 'RECEIVING ALL PRESETS' message when a bank of presets is transmitted. The transmitted bank will replace the current bank.

BULK DUMP:

The LP will display a 'RECEIVING BULK DUMP' message when a bulk dump is transmitted.

FIRMWARE UPDATES:

The LP will display a 'RX FIRMWARE' message when a firmware update is transmitted. Additional status messages may appear on the second line of the display as the transmission executes. After the firmware update is completed, the LP will automatically reset.

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D. System Utilities Menus

System Utilities provide a set of useful system commands, including commands to calibrate, restore factory defaults and set global system options. There are seven pages of System Utilities menus, beginning with the Version number display.

The second page of the System Utilities menu displays the Headphone Volume (HP VOL) menu , which allows you to scale the headphone volume in relation to the output volume. This can be adjusted from 0 (off) to 255 (max). To change the scale value, use the **CURSOR** to move to the scale parameter field then use the **VALUE** knob to select the desired value.

The third page of the System Utilities menu allows you to enable or disable menu wrapping. When menu wrapping is enabled ('ON'), menus will wrap back to the beginning when you reach the end. When disabled ('OFF'), menus will not wrap. To enable/disable menu wrapping, use the **CURSOR** to move to the ON/OFF parameter field, then use the **VALUE** knob to select the desired value. The default is 'ON'.

The fourth page of the System Utilities menu allows you to perform a Master Reboot of the LP, which is similar to turning the power OFF and ON. To perform this action, press **ENTER.**

You will be asked to confirm this operation (Yes/No). If you are unsure, select NO and press **ENTER** to return to the System Utilities menu without any action. If you are sure, use the **VALUE** knob to select YES and press ENTER. This will reboot the LP.

The fifth page of the Systems Utilities menu allows you to restore the global default values, performance sets and all factory presets. When you are ready to execute this operation, press **ENTER** to activate.

Note: You should back up any presets you wish to save prior to performing this action.

You will be asked to confirm this operation (Yes/No). If you are unsure, select NO and press **ENTER** to return to the System Utilities menu without any action. If you are sure, use the **VALUE** knob to change from NO to YES and press **ENTER.** This will restore the factory default global values, performance presets and factory presets.

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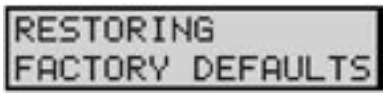


While the restore process is taking place, the LCD will briefly display a 'RESTORING FACTORY DEFAULTS' message. When complete, the screen will return to the System Utilities menu.

The sixth page of the System Utilities menu allows you to calibrate the Little Phatty. In the past, calibration of analog synthesizers had to be performed manually by experienced service personnel. The LP's built-in calibration utilities now allow you to perform many of these procedures yourself, without the expense and hassle of shipping the LP back to the factory for calibration. The LP's calibration utilities allow you to perform individual calibrations on the pitch wheel, oscillators and note range. For example, the Note Calibration operation individually tunes each note exactly for each oscillator and octave setting. This tuning information is stored in the LP's EEPROM and referenced when playing a note to guarantee that the LP's oscillators will be in tune. Other calibrations ensure that variable controls such as the pitch wheel and oscillator 2 detuning function predictably and precisely.

To access the calibration options, press **ENTER**, then use the **VALUE** knob to select the desired calibration.

Notes: All calibration procedures should be thoroughly reviewed before proceeding. Observe the following precautions and recommendations before attempting any calibration operation.

1. The LP must be at a stable and constant temperature during calibration. You should allow the LP to warm up 30 minutes before beginning any calibrations.

2. The Note Calibration procedure takes about two hours to cover the full MIDI note range. If you are performing this calibration, allow sufficient time for the calibration process to complete.

3. The LP is calibrated at the factory. The Note Calibration operation is not necessary unless the LP goes out of tune. The Note Calibration overwrites the current calibration lookup table (LUT). Performing a Factory Restore operation will not cause the LUT to revert to the factory calibration.

4. You can exit out of a calibration at any time by pressing the MASTER button. For the Note Calibration operation, only those notes that have already been calibrated will be saved. The remaining notes will revert to their previous calibration values. Interrupting the Note Calibration operation in this manner may result in inaccurate tuning.

5. Note Calibration is not meant for overall tuning drifts, such as if the LP is 10 cents sharp. Small tuning drifts are best taken care of using the AutoTune function.

6. If you perform a Note Calibration, it is highly recommended that you also perform the Oscillator 2 Frequency Calibration to ensure accurate frequency tracking with the new LUT.

CALIBRATION (con't)

PITCH WHEEL:

This calibration option allows you to select Pitch Wheel calibration. This is a manual calibration that should only be performed if you are experiencing trouble with the pitch wheel and believe it needs re-calibration. Press **ENTER** to access the Pitch Wheel calibration menu.

You will be asked if you wish to proceed. Use the **VALUE** knob to select YES or NO. If you are uncertain, or if you change your mind about performing this calibration, select NO and press **ENTER**. You will be returned to the System Utilities Calibration menu. Otherwise, select YES and press **ENTER**.

When Pitch Wheel calibration is enabled, the display appears as shown. The values displayed indicate the minimum, middle and maximum positions of the pitch wheel.

When you see this display, perform the following operations:

1.) Move the Pitch Wheel to the minimum position (all the way towards you). The left-hand number will go to some minimum value.

2.) Move the Pitch Wheel to the maximum position (all the way towards the panel). The right-hand number will go to some maximum value.

3.) Release the Pitch Wheel and let it snap back to the middle position. The middle number should settle around 2048 (±20).

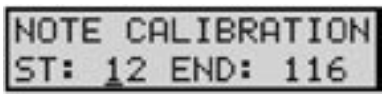
This completes the Pitch Wheel calibration. To exit the calibration, press **ENTER** to return to the System Utilities Calibration menu or press **MASTER** to exit the calibration and return to the highest level of the System Utilities menu.

Note: If this calibration is done incorrectly, the Pitch Wheel will not operate normally and may not function at all. If this should this happen, try recalibrating the Pitch Wheel again using the procedure described.

CALIBRATION (con't)

NOTE CALIBRATION:

This calibration option allows you to select Note calibration. This calibrates individual notes exactly for each oscillator and octave setting. Press **ENTER** to access the Note calibration menu.



The Note calibration menu will be displayed, allowing you to set the calibration range. The default note range is MIDI notes 12 - 116. For every one of these notes, the pitches are calibrated at each of the octave settings, from 16' to 2'. To change the range, use the **CURSOR** button to move to the start or end field, and use the **VALUE** knob to select the MIDI note value. Then press **ENTER.**

Note: A full Note calibration using the default range (12 - 116) can take about two hours to complete. By specifying a narrower range of notes (for example, just the range of the LP keyboard without octave transpose [48-84], or with octave transpose [24-108]), you can shorten the calibration time.

You will be asked if you wish to proceed. Use the **VALUE** knob to select YES or NO. If you are uncertain or if you change your mind about performing this calibration, select NO and press **ENTER**. You will be returned to the System Utilities Calibration menu. Otherwise, select YES and press **ENTER**.

Calibration will begin, and the display will appear as shown. The values displayed are the MIDI note number being calibrated, the calibration value (this is the value stored in the LP's EEPROM), and the actual measured note in MIDI Note Number Cents (in the example shown here, '32.01' indicates MIDI note 32 and the actual measured note is 01 cents sharp). Note calibration will proceed through the specified range of notes, tuning each note individually, first for oscillator 1 and then oscillator 2.

Note: You can exit out of Note calibration at any time by pressing the MASTER button. Only those notes that have been calibrated up to that point will be saved. The remaining notes will revert to their previous calibration values. Interrupting the Note Calibration operation in this manner may result in inaccurate tuning.

When Note calibration is complete, the message 'SUCCESSFUL' will appear on the display and the new calibration values will be stored in the LP's EEPROM. To exit the calibration, press **ENTER** to return to the System Utilities Calibration menu or press **MASTER** to exit the calibration and return to the highest level of the System Utilities menu.

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CALIBRATION (con't)

PITCH WHEEL AMOUNT:

This option allows you to select Pitch Wheel Amount calibration. This calibrates the Pitch Wheel Amount parameter to precise semitone values (± 2, 3, 4, 5, 7 and 12). Press **ENTER** to access the Pitch Wheel Amount calibration menu.

You will be asked if you wish to proceed. Use the **VALUE** knob to select YES or NO, then press **ENTER**. If you are uncertain, or if you change your mind about performing this calibration, select NO and press **ENTER**. You will be returned to the System Utilities Calibration menu. Otherwise, select YES and press **ENTER**.

Calibration will begin, and the display will appear as shown. The first number displayed is the amount of pitch bend being calibrated (in this example, +2 means 'plus two semitones'). The second number is the calibration value (this is the value stored in the LP's EEPROM), and the third number is the actual measured note, which is displayed in MIDI Note Number Cents (in this example, '62.36' indicates MIDI note 62, and the actual measured note is 36 cents sharp). All Pitch Amount calibrations are based on MIDI note 60, so for a calibration value of +2, the target note value is 62.00. As the calibration operation proceeds, the calibration values will increment first through all of the positive Pitch Wheel amounts (+2, +3, +4. +5, +7, +12) and then all of the negative Pitch Wheel amounts (-2, -3, -4, -5, -7, -12).

When the calibration is complete, the message 'SUCCESSFUL' will appear on the display and the new calibration values will be stored in the LP's EEPROM. To exit the calibration, press **ENTER** to return to the System Utilities Calibration menu or press **MASTER** to exit the calibration and return to the highest level of the System Utilities menu.

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CALIBRATION (con't)

OSCILLATOR 2 FREQUENCY (OSC2 FREQ):

This option allows you to select OSC2 Frequency Calibration. This calibrates the **OSC2 FREQ** control so that turning the editing dial all the way CCW turns OSC2 down exactly a fifth (-7 semitones) and turning all the way CW turns OSC2 up exactly a fifth (+7 semitones). Press **ENTER** to access the OSC2 Frequency Calibration menu.

You will be asked if you wish to proceed. Use the **VALUE** knob to select YES or NO. If you are uncertain, or if you change your mind about performing this calibration, select NO and press **ENTER**. You will be returned to the System Utilities Calibration menu. Otherwise, select YES and press **ENTER**.

Calibration will begin, and the display will appear as shown. The first number that appears on the display is the base note for calibration (MIDI note 60). The second number is the calibration value (this is the value stored in the LP's EEPROM), and the third number is the actual measured note, which is displayed in MIDI Note Number Cents (in the example shown here, '64.37' indicates MIDI note 64, and the actual measured value is 37 cents sharp). When calibration starts, the LP first tunes itself to the base note. As this happens, you will see the measured note value hone in on 60.00. Then the calibration value will change as the note climbs to 67.00, at which point it has calibrated the maximum value (+7 semitones), and then the note descends to 53.00 at which point it has calibrated the minimum value (-7 semitones).

When the calibration is complete, the message 'SUCCESSFUL' will appear on the display and the new calibration values will be stored in the LP's EEPROM. To exit the calibration, press **ENTER** to return to the System Utilities Calibration menu or press **MASTER** to exit the calibration and return to the highest level of the System Utilities menu.

Performance Sets

Performance Sets is a feature that allows you to customize the order of LP presets for a live performance situation or to enhance your productivity in a studio environment.

Performance Sets are based on the idea that during a performance, you may need to switch between a sequence of sounds that doesn't necessarily match up to the preset locations. Performance Sets gives you the ability to set up sequences of sounds that you can step through easily and quickly during a performance.

The LP has four Performance Sets located in the Master menu. Each Performance Set contains eight preset entries, so set 1 has an array of 8 presets; set 2 has an array of 8 presets, etc. Viewed as a table, the Performance Sets might look like this:

SET	PRESET 1	PRESET 2	PRESET 3	PRESET 4	PRESET 5	PRESET 6	PRESET 7	PRESET 8
1	24	58	02	89	34	38	23	01
2	02	03	51	05	06	92	07	08
3	99	38	56	57	12	13	48	76
4	34	35	36	37	44	45	46	47

The first entry in Set 1 above is Preset 24; the second entry is Preset 58, and so on. Performance Sets allow you to sequence up to 32 presets for your specific needs. Once the Performance Sets are configured, you can call up a set and step though the sequence using the **VALUE** switch.

The example on the right shows the preset stored in the first location of Performance Set 3 (Preset 99 – SUPERCHUNK). To step through this sequence, press the **VALUE** switch. Each press will advance to the next preset in the sequence. After the eighth preset is reached, the next press of the **VALUE** switch will cycle back to the first preset in Performance Set 3.

To return to Preset mode, press the **PRESET** button. The preset displayed will be the last preset selected in the Performance Set.

Pressing the **MASTER** button again will return to the last used master menu entry.

Note: The factory default setup for Performance Sets is shown below. When you perform a Factory Restore operation, all Performance Sets will default to these values:

SET	PRESET 1	PRESET 2	PRESET 3	PRESET 4	PRESET 5	PRESET 6	PRESET 7	PRESET 8
1	00	01	02	03	04	05	06	07
2	08	09	10	11	12	13	14	15
3	16	17	18	19	20	21	22	23
4	24	25	26	27	28	29	30	31

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Editing Performance Sets

To edit a Performance Set, use the **CURSOR** key to select the Performance SET number (1-4), ENTRY location (1-8) and PRESET (00-99). For example, to select the SET number, press the **CURSOR** button once to highlight the SET number for editing. Press the **CURSOR** button a second time to advance to the ENTRY location, and a third time to advance to the PRESET.

In the example show here, the SET number is ready to be changed. The number is changed by rotating the **VALUE** knob. For this example, we'll change the SET number to 1, and then advance to the next parameter by pressing the **CURSOR** button.

The ENTRY value is now ready to be changed. Using the **VALUE** knob, we'll change the ENTRY value to 5, and then hit the **CURSOR** button again to advance to the PRESET.

Now we're ready to change the PRESET entry. Again using the **VALUE** knob, we'll change the PRESET to 23.

If no further editing is required, we can now exit this mode by hitting the **MASTER** button.

This places us back where we started in Performance Sets. There are no parameters highlighted, and the **MASTER** button is lit. Preset 23 - LUCKY MAN is the active preset, ready for playing.

To return to Preset mode, press the **PRESET** button. The preset displayed will be the last preset selected in the Performance Set.

Pressing the **MASTER** button again will return you to the last used master menu entry.

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Activating the Arpeggiator and Latch

Turning the Arpeggiator ON/OFF

When a preset has the Arpeggiator function enabled, you turn the Arpeggiator ON and OFF by pressing the VALUE encoder switch (you must be in PRESET mode to engage the Arpeggiator).

When the Arpeggiator is ON, an 'A' will appear on the bottom line of the display:

With the Arpeggiator ON, any note or group of notes you play will be sequenced according to the settings in the Arpeggiator menu. To turn the Arpeggiator OFF, simply press the VALUE encoder. The Arpeggiator will switch OFF and the display will revert to the previous view:

NOTE: In previous versions of the Little Phatty OS, the VALUE encoder switch was used to advance presets. In OS 2.0, the VALUE encoder switch operation has been changed to activate the Arpeggiator exclusively. The VALUE encoder switch is still used in MASTER Mode to step through the presets in Performance Sets. Note, however, that if a preset selected from the MASTER Mode Performance Sets has the Arpeggiator function enabled and you wish to turn the Arpeggiator ON for that preset, you will need to return to PRESET Mode first, and then press the VALUE encoder switch to activate the Arpeggiator.

Turning the Arpeggiator Latch ON/OFF

When the Latch function is enabled in the Arpeggiator menu and the Arpeggiator is switched ON, pressing the **ENTER/STORE** button turns the Latch ON. When the Latch is ON, an 'L' will replace the 'A' on the bottom line of the display:

As long as the Latch is ON, the Arpeggiator will keep looping in its current state. Any new note or group of notes will initiate a new note sequence based on the Arpeggiator Menu settings. If any notes are played and held while the Latch is ON, playing additional notes adds to the current list of notes to be arpeggiated. If all notes are released, the first new note played will initiate a new note sequence.

To turn the Latch OFF, simply press the **ENTER/STORE** button. The Latch will switch OFF and the 'L' in the display will be replaced by an 'A', indicating that the Arpeggiator is still active:

NOTES:
1. When the Latch is ON, you can turn the Arpeggiator ON/OFF using the VALUE encoder switch.
2. If the Arpeggiator Mode is 'One-shot' when the Latch is ON, the Arpeggiator will make one pass of the note sequence and then stop.
3. When the Arpeggiator is switched OFF, the ENTER/STORE button will revert to the default action of initiating a Preset Save sequence.

Arpeggiator Examples

The Arpeggiator takes the currently played note or group of notes and forms an arpeggio based on the Arpeggiator Menu settings. Here are some simple examples of the Arpeggiator function:

Example 1. Pattern = UP, Octaves = 1, Mode = LOOP

PLAY & HOLD NOTE	THE ARPEGGIATOR PLAYS
C3	C3, C4, C3, C4...
Add E3	C3, E3, C4, E4...
Add G2	G2, C3, E3, G3, C4, E4, G2...
Add A3	G2, C3, E3, A3, G3, C4, E4, A4, G2...
Release E3	G2, C3, A3, G3, C4, A4. G2...

Example 2. Pattern = DN, Octaves = 1, Mode = LOOP

PLAY & HOLD NOTE	THE ARPEGGIATOR PLAYS
C3	C4, C3, C4, C3...
Add E3	E3, C3, E4, C4, E3...
Add G2	E3, C3, G2, E4, C4, G3, E3...
Add A3	A3, E3, C3, G2, A4, E4, C4, G3, A3...
Release E3	A3, C3, G2, A4, C4, G3, A3...

Example 3. Pattern = UP, Octaves = 1, Mode = BACK-FORTH

PLAY & HOLD NOTE	THE ARPEGGIATOR PLAYS
C3	C3, C4, C3, C4...
Add E3	C3, E3, C4, E4, C4, E3, C3, E3...
Add G2	G2, C3, E3, G3, C4, E4, C4, G3, E3, C3, G2, C3...
Add A3	G2, C3, E3, G3, A3, G3, C4, E4, A4, E4, C4, G3...
Release E3	G2, C3, G3, A3, G3, C4, A4, C4, G3...

Example 4. Pattern = ORDERED, Octaves = 1, Mode = LOOP

PLAY & HOLD NOTE	THE ARPEGGIATOR PLAYS
C3	C3, C4, C3, C4...
Add E3	C3, E3, C4, E4...
Add G2	C3, E3, G2, C4, E4, G3, C3...
Add A3	C3, E3, G2, A3, C4, E4, G3, A4, C3...
Release E3	C3, G2, A3, C4, G3, A4, C3...

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How the LP handles MIDI

When you adjust any one of the LP's four analog edit controls, MIDI Continuous Controller (CC) messages are generated and transmitted on the MIDI Out connector. The information contained in these MIDI messages varies according to the parameter assignment for that analog edit control. For example, when the front panel **LFO RATE** switch is selected, the analog edit control in the Modulation Section generates MIDI CC data corresponding to the LFO Rate parameter (CC#03). MIDI CC messages are also generated when you adjust Preset parameter values in the menus; this gives you total control of all LP sound parameters via MIDI.

The tables on the following pages list all MIDI CC messages and values for the Little Phatty.

NOTES:

1. The LP sends and receives 7-bit MIDI CC messages for all parameters except for the Modulation Wheel and Filter Cutoff, which send and receive high-resolution, 14-bit MIDI CC messages. This allows for finer control and smoother changes for these parameters, whether your are using the LP as a MIDI controller, or controlling the LP via MIDI from a sequencer or DAW. For these two parameters, the MSB indicates the 'regular' CC number, and the LSB indicates the high-resolution 'fine' control value. If you are only sending 7-bit MIDI CC messages to the LP, use the MSB channel number by itself for these two parameters.

2. The Arpeggiator Clock Rate is set by two MIDI CC messages that correspond to coarse and fine clock rates. The coarse rate is set by CC#04 in increments of 3 BPM over a range of 21-320 BPM, and the fine rate is set by CC#36 in increments of 0.1 BPM. To set the clock rate, first set the coarse rate by dividing the target BPM by three; the integer result (the whole number) will be the CC#04 value. Then set the fine clock rate by subtracting the coarse BPM value from the target value and multiplying the result by 10. This will be the CC#36 value.

   For example, to set the Arpeggiator Clock Rate to 121.7 BPM:

   Determine the MIDI CC coarse value by dividing the target BPM by 3:

   121.7/3 = 40.566

   The CC#04 value is '40' (=120 BPM)

   Determine the MIDI CC fine value by subtracting the coarse BPM value from the target value:

   121.7 - 120 = 1.7

   Then multiply the result by 10:

   1.7 * 10 = 17

   The CC#36 value is '17'

   For CC#04 = 40 and CC#36 = 17, the LP's display will show '121.7 BPM'. (Note that in order to display the internal BPM on the LP's LCD, the Arpeggiator must be ON and the Arpeggiator Clock must be set to 'INT'.)

3. The MIDI CC assignments shown for each section are over-ridden when Pot Mapping is enabled in that section. For more on programming and enabling Pot Mapping, see page 37.

SECTION	CONTROL/PARAMETER	FUNCTION	CC	VALUE/RANGE
Interface Panel	MASTER	Master mode switch	-	-
	PRESET	Preset mode switch	-	-
	CURSOR	Navigation control	-	-
	ENTER	Data entry control	-	-
	GLIDE ON/OFF	Turns Glide ON/OFF	65	0 (OFF), 64 (ON)
	OCTAVE UP	Octave increment switch	-	-
	OCTAVE DOWN	Octave decrement switch	-	-
Modulation	LFO RATE	Adjusts the LFO frequency	3	0 – 127
	AMOUNT	Adjusts the modulation amount	6	0 – 127
	SOURCE	Selects the modulation source	68	0 (TRI), 16 (SQUARE) 32 (SAW), 48 (RAMP) 64 (FILT ENV), 80 (OSC2)
	DESTINATION	Selects the modulation destination	69	0 (PITCH), 16 (FILT) 32 (WAVE), 48 (OSC2)
	LFO SYNC SOURCE	Selects the LFO synchronization source	102	0 (INT), 64 (MIDI CLK)
	LFO SYNC CLOCK DIV	Sets the LFO synchronization clock divider	103	See table for list of values
	MOD SOURCE 5	Selects the Mod 5 Source	104	0 (FILT), 64 (S&H)
	MOD SOURCE 6	Selects the Mod 6 Source	105	0 (OSC2), 64 (NOISE)
	MOD DEST 2	Selects the second mod destination	106	0 (OFF), 25 (PITCH) 50 (FILT), 75 (WAVE) 100 (OSC2)
Oscillators	OSC 1 OCTAVE	Sets the octave of oscillator 1	74	0 (16'), 32 (8') 48 (4'), 64 (2')
	WAVE	Sets the waveform of oscillator 1	9	0 – 127
	OSC 1 LEVEL	Adjusts the volume level of oscillator 1	15	0 – 127
	GLIDE RATE	Sets the portamento rate time	5	0 – 127
	1-2 SYNC	Turns oscillator sync ON/OFF	77	0 (OFF), 64 (ON)
	OCTAVE	Sets the octave of oscillator 2	75	0 (16'), 32 (8') 48 (4'), 64 (2')
	OSC 2 FREQ	Adjusts the frequency of oscillator 2	10	0 – 127
	WAVE	Sets the waveform of oscillator 2	11	0 – 127
	OSC 2 LEVEL	Adjusts the volume level of oscillator 2	16	0 – 127
	PITCH BEND UP AMT	Selects the pitch end UP amount	107	0 – 127
	PITCH BEND DN AMT	Selects the pitch bend DOWN amount	108	0 – 127
Filter	CUTOFF (SEE NOTE 1)	Adjusts the filter cutoff frequency	19 (MSB) 51 (LSB)	0 – 127
	RESONANCE	Adjusts the filter resonance parameter	21	0 – 127
	KB AMOUNT	Adjusts the amount of pitch CV affecting the cutoff	22	0 – 127
	EG AMOUNT	Adjusts the EG amount affecting the cutoff	27	0 – 127
	OVERLOAD	Adjusts the amount of filter overdrive	18	0 – 127
	FILTER POLES	Selects the number of filter poles	109	0 (1), 32 (2), 64 (3), 96 (4)
	FILTER VELOCITY SENS	Sets the amount of filter velocity sensitivity	110	See table for list of values

LP Stage II MIDI CC messages

SECTION	CONTROL/PARAMETER	FUNCTION	CC	VALUE/RANGE
Envelope Generator	ATTACK	Adjusts the filter envelope attack time	23	0 – 127
	DECAY	Adjusts the filter envelope decay time	24	0 – 127
	SUSTAIN	Sets the filter envelope sustain level	25	0 – 127
	RELEASE	Adjusts the filter envelope release time	26	0 – 127
	ATTACK	Adjusts the volume envelope attack time	28	0 – 127
	DECAY	Adjusts the volume envelope decay time	29	0 – 127
	SUSTAIN	Sets the volume envelope sustain level	30	0 – 127
	RELEASE	Adjusts the volume envelope release time	31	0 – 127
	EGR RELEASE ON/OFF	Sets the state of the EGR Release parameter	111	0 (OFF), 64 (ON)
	EGR LEGATO	Sets the state of the EGR Legato parameter	112	0 (ON), 43 (OFF) 86 (RESET)
Arpeggiator	ARPEGGIATOR ENABLE	Enables/disables the Arpeggiator	113	0 (OFF), 64 (ON)
	ARP RUN/STOP	Starts and stops the Arpeggiator	90	0 (OFF), 64 (ON)
	ARP CLOCK RATE (SEE NOTE 2)	Sets the Arpeggiator Clock Rate	4 (coarse) 36 (fine)	0 – 127
	ARP CLOCK SOURCE	Sets the Arpeggiator Clock Source	114	0 (INT), 43 (LFO) 86 (MIDI)
	ARP CLOCK DIVISIONS	Sets the Arpeggiator Clock Divider	115	See table for list of values
	ARP RANGE (OCTAVES)	Sets the Arpeggiator Octave Range	116	0 (-3), 19 (-2) 38 (-1), 57 (0), 71 (+1) 90 (+2), 109 (+3)
	ARP PATTERN	Selects the Arpeggiator Pattern	117	0 (UP), 43 (DOWN) 86 (ORDER)
	ARP MODE	Selects the Arpeggiator Mode	118	0 (LOOP) 43 (BACK/FORTH) 86 (ONCE)
	ARP LATCH ENABLE	Enables/disables the Arpeggiator Latch	119	0 (OFF), 64 (ON)
	ARP LATCH/UNLATCH	Sets the Latch/Unlatch status	91	0 (OFF), 64 (ON)
Output	VOLUME	Volume Control	7	0 – 127
Keybd	KEYBOARD NOTE PRIORITY	Selects the Keyboard Note Priority	88	0 (GLOB), 32 (LOW) 64 (HIGH), 96 (LAST)
Left-Hand Controller	MOD WHEEL (SEE NOTE 1)	Modulation Performance Control	1 (MSB) 33 (LSB)	0 – 127

LP Stage II MIDI CC messages

TIME VALUE	CLOCK DIVIDER (LP DISPLAY)	VALUE
1/32 note	1/32	0
Dotted 1/32 note	1/32 DOT	8
1/16 note	1/16	16
Dotted 1/16 note	1/16 DOT	24
1/8 note	1/8	32
Dotted 1/8 note	1/8 DOT	40
Quarter note	1/4	48
Dotted quarter note	1/4 DOT	56
Half note	1/2	64
Dotted half note	1/2 DOT	72
Whole note	WH	80
Whole note + quarter note	WH + 1/4	88
Whole note + half note	WH + 1/2	96
Whole note + dotted half note	WH + 1/2 DOT	104
Whole note + whole note	WH + WH	112

MIDI CC values for the LFO and Arpeggiator Clock Divider (CC#103 & CC#115)

FILTER VELOCITY SENSITIVITY	VALUE
-8	0
-7	12
-6	19
-5	26
-4	33
-3	40
-2	47
-1	54
0	61
+1	68
+2	75
+3	82
+4	89
+5	96
+6	103
+7	110
+8	117

MIDI CC values for Filter Velocity Sensitivity (CC#110)

Appendix A - MASTER MODE Menu Tree

The structure of the Master Mode menus is shown below. With the exception of the Advanced Preset parameters, which are individually stored with each preset, all Master Mode menu parameters effect the LP globally.

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Appendix B - LFO Sync Modes

There are two LFO Sync Modes: INTERNAL and MIDI CLOCK.

INTERNAL:

When the LFO Sync Mode is set to 'INTERNAL', the LFO rate is controlled directly via the **MODULATION** knob (when the **LFO RATE** panel button is selected), or by Tap Tempo, or by sending a MIDI CC#3 command with a value between 0-127 (MIDI CC#3 controls the LFO RATE).

When the Tap Tempo function is engaged, the internal LFO Rate is adjusted directly by tapping the **LFO RATE** button. You can also adjust the LFO rate using the **MODULATION** control as normal, and this will override the rate set by Tap Tempo. Note that the **LFO RATE** panel button will continue to blink, indicating that Tap Tempo is still active - you can tap in a new tempo at any time. To disengage Tap Tempo mode, press and hold the **LFO RATE** button. The LFO Rate will remain at the last rate you selected.

MIDI CLOCK:

When the LFO Sync Mode is set to 'MIDI CLOCK,' the LFO rate is synchronized to incoming MIDI Clock pulses, with one LFO cycle equal to the note duration set by the LFO SYNC CLOCK parameter. The Little Phatty must have a MIDI Input enabled in the MIDI Setup menu in order to receive MIDI Clock. The Little Phatty Stage II has both USB and standard DIN MIDI inputs, and can receive MIDI Clock signals on either input. It is recommended not to send different clock signals to both inputs simultaneously, unless you want some very strange LFO signals to result!

If you change the Sync Mode from 'INTERNAL' to "MIDI CLOCK" while the LP is not receiving a MIDI clock signal, the actual LFO rate will not change right away; it will continue at the same rate. However, the LFO rate is no longer being controlled by the internal LFO clock. This means that if you try to control the LFO Rate from the panel knob or send a MIDI CC# 3 message while the LFO Sync Mode is set to MIDI CLOCK, the actual rate of the LFO will not change. NOTE: These actions still update the internal "LFO Clock rate" parameter, but this parameter is offline while the LFO Sync MODE is set to 'MIDI CLOCK'. If you change the LFO Sync Mode back to 'INTERNAL', the rate of the LFO will jump to the internal LFO Clock rate.

If the LFO is synchronized to a MIDI Clock pulse and the MIDI Clock is stopped, the LFO will continue at the last MIDI Clock rate it received. If you hear a change in the rate of the LFO when you stop sending a MIDI Clock signal, it is a sign of jitter or instability in your MIDI Clock source. The Little Phatty performs a running average of the clock pulses it receives, so the more stable your MIDI Clock source, the smoother the resulting LFO waveform will be. Very unstable clock sources can cause distortion in the LFO waveform, due to the constant LFO Rate corrections required to stay in sync with an unstable timing signal.

When the Tap Tempo is engaged and a valid tempo is tapped in, Tap Tempo overrides MIDI Clock sync for the LFO. The LFO reverts to the MIDI Clock rate when Tap Tempo is disengaged.

Appendix C - Arpeggiator Clock Source

There are three Arpeggiator Clock Sources: Internal (INT), LFO, and MIDI Clock (MIDI). Detailed descriptions of these clock source options appears below.

INTERNAL:

When the Arpeggiator Clock Source is set to INTERNAL, the Arpeggiator runs at the internal Arpeggiator Clock rate. This defaults to the clock rate saved in the currently-active preset. You can change the internal Arpeggiator clock rate by using the **MODULATION** control, or by Tap Tempo, or by sending a MIDI CC#90 command with a value in the range 0-127. While the arpeggiator is running, you can change its internal clock rate by selecting the **LFO RATE** panel button and adjusting the **MODULATION** control. The lower line of the Little Phatty LCD will display 'ARP XXX BPM', showing the tempo of the arpeggiator clock. Note that due to the shared controls, you cannot use the **MODULATION** control to adjust the internal LFO Rate while the Arpeggiator is running in this mode. However, you can still adjust the LFO Rate remotely by sending a MIDI CC#3 command.

When the Tap Tempo function is engaged, the Arpeggiator Clock is adjusted directly by tapping the **LFO RATE** button. You can also adjust the Arpeggiator Clock using the **MODULATION** control (provided that prior to engaging Tap Tempo, the **MODULATION** control was set to adjust the Modulation Rate and not the Amount). Adjusting the Arpeggiator Clock in this manner will override the rate set by Tap Tempo. Note that the **LFO RATE** panel button will continue to blink, indicating that Tap Tempo is still active - you can tap in a new Arpeggiator Clock at any time. To disengage Tap Tempo mode, press and hold the **LFO RATE** button. The Arpeggiator Clock will remain at the last rate you selected.

LFO:

When the Arpeggiator Clock Source is set to LFO, the Arpeggiator rate is defined as one whole note per LFO cycle. Unlike Internal mode, you can adjust the internal LFO Rate directly from the panel while the Arpeggiator is running. The Arpeggiator Clock Divider (CLK DIV) determines how many notes the Arpeggiator plays per LFO cycle. Note that you can still choose either Internal or MIDI Sync to be the LFO Clock source, independent of this setting. The Arpeggiator will follow the LFO rate in either case.

MIDI:

When the Arpeggiator Clock Source is set to MIDI, the Arpeggiator rate is directly synchronized to incoming MIDI clock. If there is no MIDI clock signal present, the arpeggiator will not play (and in fact, you will not hear any notes from the LP keyboard!). The Arpeggiator Clock Divider (CLK DIV) determines how many notes the Arpeggiator plays per measure.

PERFORMANCE TIPS:

1. When the Arpeggiator Clock Source is set to 'INT', you can use the Tap Tempo function to get clock rates that fall outside the minimum and maximum rates available from the MODULATION control.

2. When the Arpeggiator Clock Source is set to 'MIDI', if the Latch is enabled and a latched arpeggio pattern is playing, you can stop the MIDI clock and the pattern will stop playing; when you restart the MIDI clock, the latched pattern is retained and it will resume playing again.

Appendix D - The Calibration Preset

The LP has a specific Calibration Preset that is stored in a non-volatile memory location labeled 'CA' (this preset location appears after preset 99). The Calibration Preset is a single-oscillator squarewave tone that plays Oscillator 1 at full level. This preset is used primarily for the LP'S AutoTune function, but it can also be used for tuning the LP with an external tuner. Since the CA preset can be modified like any other preset, it's also useful as a default starting point for preset development. Note that the Calibration Preset cannot be saved to the CA memory location, but it can be saved to any other preset location (00-99).

The tables below list the default values of the Calibration Preset (bold text is used to indicate Precision Mode values).

SECTION	PARAMETER	VALUE
Modulation	LFO RATE	**0**
	AMOUNT	**0**
	SOURCE	SQUARE
	DESTINATION	WAVE
Oscillators	OSC 1 OCTAVE	16'
	WAVE	**2048**
	OSC 1 LEVEL	**4095**
	GLIDE RATE	**1726**
	1-2 SYNC	OFF
	OCTAVE	16'
	OSC 2 FREQ	**2048**
	WAVE	**2048**
	OSC 2 LEVEL	**0**
Filter	CUTOFF	**4095**
	RESONANCE	**0**
	KB AMOUNT	**2701**
	EG AMOUNT	**2048**
	OVERLOAD	**0**
Envelope Generator	ATTACK	**0**
	DECAY	**0**
	SUSTAIN	**2048**
	RELEASE	**0**
	ATTACK	**0**
	DECAY	**0**
	SUSTAIN	**4095**
	RELEASE	**0**

SECTION	PARAMETER	VALUE
Advanced Preset Parameters	FILTER POLES	4
	EGR RELEASE	ON
	GATE	LEGATO ON
	FILTER SENSITIVITY	0
	MOD SOURCE 5	FILT
	MOD SOURCE 6	OSC2
	PB UP/DN	+2 / -2
	MOD DEST2	OFF

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Appendix E - Accessories

To further enhance the functionality of the Little Phatty, Moog Music offers the following optional accessories. For complete information on everything listed here, including pricing and ordering info, see your Moog dealer, or visit www. moogmusic.com

CV Output Modification

The CV Output Modification adds five ¼" analog CV outputs to the LP, giving you the power to control Moogerfoogers and other analog gear with Control Voltages generated by your Little Phatty. The five CV outputs are: Gate, Pitch, Filter Envelope, Volume Envelope, and Mod Bus. The CV outputs appear on jacks located on the right side panel. Note: The CV Output Modification is available as a Factory Upgrade only; Field Upgrades are not available. Contact the factory for more information.

EP2 Expression Pedal

The EP2 Expression Pedal is the finest expression pedal available. Its smooth action gives it the accuracy musicians need for precise, playable control. The heavy construction (2.5 lbs) provides a solid feel, and an output level control allows you to adjust the expression range of the pedal.

CP-251 Control Voltage Processor

The CP-251 Control Voltage Processor offers a number CV processing options that can be used with any Little Phatty, Moogerfooger analog effects module, or other voltage-controlled gear. The CP-251 provides a dual waveform LFO, Noise Generator, Sample-and-Hold circuit, as well as two active Attenuators, a Lag Processor, a CV Mixer and a 4-way Multiple. The combination gives you ways to modify, mix, and distribute control voltages to produce the incredible variety of sounds and effects that analog synthesizers are famous for.

VST Little Phatty Editor

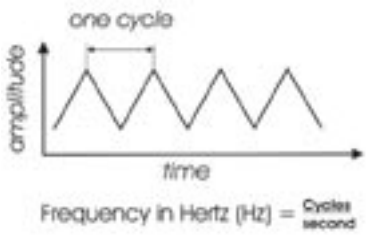
The VST Little Phatty Editor is a VST-format software application that provides full control and editing of presets and performance controls on your Little Phatty via MIDI from within your VST-compatible host application. It allows total management of custom sounds directly within your sequencing or music production environment. All LP parameters are fully automatable, giving you the ability to dynamically program the Little Phatty to respond to your music (a VST-compatible host is required).

Little Phatty Editor/Librarian Software

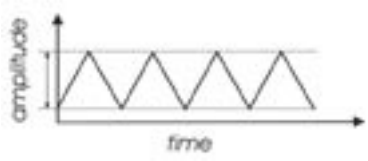
The ultimate software tool for editing and organizing Little Phatty presets. The Editor/Librarian software allows you to send, receive, edit, organize and archive individual presets or preset banks. A single edit screen provides access to all of the Little Phatty's preset parameters–including Advanced Preset functions like Pot Mapping, Filter Poles and Modulation Programming–simplifying the editing process while maximizing your creative potential. Additional capabilities include the ability to create new Presets by combining any two Presets in various ways (mix, morph, mutate or randomize), make single parameter adjustments for all 99 Presets at once, and create unlimited custom Preset banks.

Appendix F - Tutorial

For those who are new to the world of electronic music, let's take a few moments to go through the basics of sound and synthesis.



Sound is simply the audible change in air pressure. When we perceive sound, our ears are responding to variations in air pressure that happen to occur in our range of hearing. The rate of these variations is called the Frequency, which is measured in cycles per second, or Hertz (Hz). Generally, our ears can hear frequencies from about 20 Hz (on the low end) to about 20,000 Hz (on the high end). The frequency of a sound corresponds to its pitch. A low frequency corresponds to a low-pitched sound (such as a bass) and a high frequency sound corresponds to a high-pitched sound (such as a piccolo).



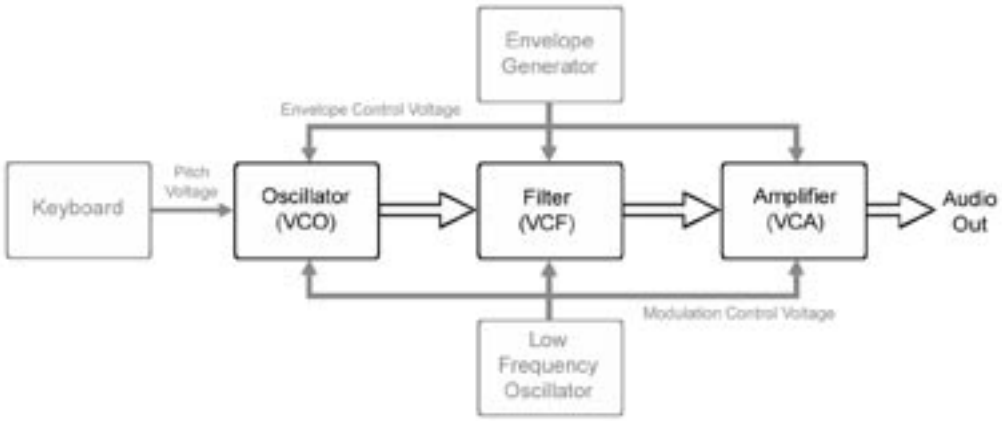
A second perception of sound is its volume or loudness. Loud sounds create big fluctuations in air pressure, while soft sounds create small fluctuations. The measurement of these fluctuations is called the Amplitude, which is measured in Decibels (dB).

A third perception of sound is its tone color, also known as its timbre. There is no standard of measurement for timbre, so instead we use familiar terms to describe the tone color of a sound – bright or dull, buzzy or mellow, tinny or full. The tone color is a function of the harmonic content of the sound. Sounds that are bright and buzzy have a lot of harmonics, while sounds that are muted and dull have few harmonics.

Harmonics are mathematically related overtones of the base pitch. To explain what that means, let's consider an example: if the base pitch is 100 Hz, harmonics will occur at 200 Hz (2 x 100), 300 Hz (3 x 100), 400 Hz (4 x 100), etc. The levels of the harmonics are always much lower than the level of the base pitch, and they decrease as the frequency goes up, so a 200 Hz harmonic will be louder than a 300 Hz harmonic, which will be louder than a 400 Hz harmonic, and so on. Note that there are some sounds that contain overtones that are not mathematically related to the base pitch. These include the 'metallic' sounds created by percussion instruments like cymbals, gongs and chimes, and noise sounds like wind or white noise. The overtones of these sounds are called 'enharmonic', as they don't fit neatly into a mathematical relationship with the base pitch.

Using the electrical circuits in synthesizers, we can manipulate the three parts of sound (pitch, volume and timbre) to create new sounds and simulate existing ones. This process is called Synthesis. There are a number of ways to synthesize sound electronically (including frequency modulation, granular, phase distortion and additive to name but a few), but the method used most often is called Subtractive Synthesis. In Subtractive Synthesis, you start with signals rich in tone color, and then eliminate (i.e. subtract) frequencies to achieve the desired sound.

A synthesizer design based on subtractive synthesis typically consists of three main components and three auxiliary components. The main components are the Oscillator, Filter and Amplifier, and the auxiliary components are the Keyboard controller, Envelope Generator, and Low Frequency Oscillator.

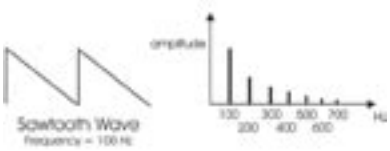


The Subtractive Synthesis Model

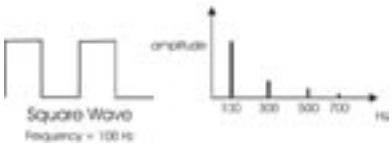
The Oscillator is the starting point of Subtractive Synthesis, for it is here that the initial sound is created. The oscillator creates electrical vibrations which function in a manner similar to the strings of a guitar; they create the signal source that the rest of the system will use to modify and shape the sound. The key oscillator parameters are pitch and waveform.

The pitch of the oscillator is primarily determined by the keyboard, which creates specific pitches based on an equal-tempered scale (more about the keyboard later).

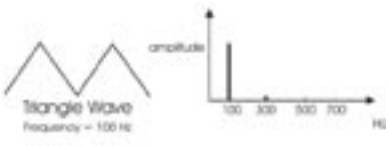
The waveform determines the harmonic richness of the audio signal. There are four basic waveforms common to most synthesizers: sawtooth, square, triangle and sine.



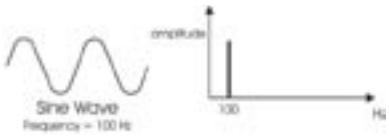
The sawtooth wave is the richest sounding of the four waves. It contains all of the harmonics, and has a bright, buzzy sound. Sawtooth waves are ideal for brass and string sounds, bass sounds and rich accompaniments.



The square wave possesses a hollow sound compared to the sawtooth, owing to the fact that it contains only odd harmonics. This hollow characteristic is ideal for distinctive lead and sustained (pad) sounds. An interesting aspect of the square wave is that the waveshape can be changed to make the top and bottom parts asymmetrical, creating a pulse wave. By changing the shape of the wave, new harmonics are introduced. Pulse waves are ideal for creating clavinet-like sounds, but are also useful for creating lush pads. Many synthesizers allow you to dynamically control the shape, or 'width' of the pulse wave using modulation sources such as a low frequency oscillator (LFO). This type of waveform control is known as 'pulse width modulation', or PWM.



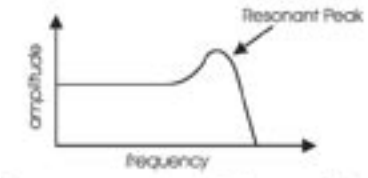
Like the square wave, the triangle wave only contains odd harmonics, but the levels of the harmonics in a triangle wave are much less. The triangle wave has a soft, slightly buzzy sound that is suitable for high-pitched leads (like a flute) or adding a beefy sub-bass to bass sounds.



The sine wave is the purest waveform of them all. It has no harmonics, so it produces a very pure tone. Because of this, sine waves generally aren't used as primary audio signals, but are often used to reinforce or enhance other waves. They are also used as modulation sources.

Synthesizers often have more than one oscillator, and each oscillator usually has its own frequency and waveform and level (volume) parameters. Several oscillators make possible rich and complex sound source configurations. Some synthesizers also permit external audio signals to serve as sound sources, allowing you to combine them with the oscillators, or process the external audio by itself using the synthesizer components.

The combined sound sources are routed to the Filter, the circuit that removes frequencies. Although there are several types of filters, the Little Phatty offers just one, but it's a very important one: the Lowpass filter.



Frequency response of a Lowpass filter with Resonance

By definition, a Lowpass filter removes high frequencies while allowing low frequencies to pass through. The frequency at which the filter works to remove high frequency signals is called the Cutoff frequency. Above the cutoff, frequencies are gradually reduced according to the filter's 'slope', which is a measure of how well the filter works. The slope of a filter is expressed in decibels per octave (dB/Oct). The Little Phatty filter is rated at 24 dB/Oct, which creates a dramatic reduction in unwanted frequencies. This is a highly desirable quality for subtractive synthesis.

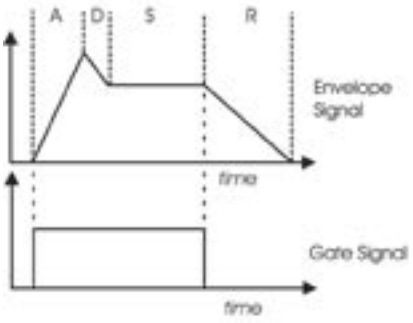
Another important filter parameter is the filter resonance. Resonance amplifies the frequencies at the cutoff frequency, emphasizing any signal frequencies that appear there. It's possible to adjust the resonance control to the point where the filter actually oscillates. When this occurs, the oscillation frequency is the same as the cutoff frequency.

The Filtered signal is routed to the Amplifier, which controls the gain (volume) of the signal. The Amplifier controls the articulation of a sound, turning it on and off as you play. The Amplifier is usually paired with an Envelope Generator (described below). The gain of the amplifier follows the contours of the Envelope Generator signal, shaping the sound from start to finish.

The Oscillator, Filter and Amplifier are voltage controlled, meaning that they respond to changes in voltages. For the Oscillator, it means the higher the voltage, the higher the pitch. For the Filter, it means the higher the voltage, the higher the cutoff frequency. For the Amplifier, this means the higher the voltage, the greater the volume. Since each of the three main components respond to a voltage, the entire synthesis system thus has a common control element. This provides great flexibility for sound programming, and allows auxiliary components, like Envelope Generators and Low Frequency Oscillators (which generate control voltages) to further vary the sound.

Returning to our Subtractive Synthesis model, the first of the auxiliary components is the keyboard. The keyboard provides a familiar musical instrument 'interface' that produces a control voltage and trigger signal whenever a key is pressed. The level of the control voltage signal is a function of which key is pressed - the higher up on the keyboard you play, the higher the level of the control voltage.

The keyboard's control voltage signal is commonly routed to the oscillators to control the pitch, and it can also be routed to other voltage-controlled components like the filter, to vary the cutoff frequency. The keyboard trigger signal is routed to the Envelope Generators to trigger the envelopes.



The second auxiliary component is the Envelope Generator, or EG. The EG makes no sound by itself. Rather, it creates a time-varying control voltage that is typically used to control the gain of the amplifier, or the cutoff frequency of the filter. Many synthesizers, including the Little Phatty, provide several EG's for independent envelope control of the amplifier and filter circuits.

The EG is triggered from a Gate signal that is generated every time a key is pressed on the keyboard. Once triggered, as long as the key is held down (i.e. the Gate signal is present), the EG envelope will evolve according to the control settings.

The LP's Envelope Generators have four stages that can be set individually:

Attack – The time to go from zero volts to the maximum voltage (the fade in time).
Decay – The time to go from the maximum voltage to the Sustain level.
Sustain – The maximum level of the envelope after completing the attack and decay stages (if the key is held). If the sustain time is zero, the envelope consists of just the attack and decay stages, and the Release control has no effect.
Release – The time to go back to zero volts when the key is released (the fade out time).

The last auxiliary component is the Low Frequency Oscillator, also known as the LFO. The LFO operates like the main oscillators in almost all respects, but generally at a much lower frequency. LFO's are typically used to send modulation control signals to the main components. For example, if you route a 6Hz LFO signal to an oscillator, it will produce vibrato by varying the pitch of the oscillator. If you send that same LFO signal to the amplifier, and you'll get tremolo. LFO's are used to create cyclical variations in the sound, making the sound more dynamic and interesting.

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So there you have it - the six basic components that make up a synthesizer based on the subtractive synthesis model. Keep in mind that most 'subtractive' synthesizers often include more than one of each component. This is especially true of the oscillators and envelope generators (the Little Phatty has two of each), but may also be true of filters, amplifiers and LFO's. For example, the Moog Voyager has three oscillators, two filters, two amplifiers, an LFO, two extensive modulation sections, and the Voyager's third oscillator can act as an additional LFO. Synthesizers that offer more than one of each type of component provide a broader palette for sound creation, resulting in sounds with a greater complexity, variation, and depth. Nonetheless, even a simple analog synth like the LP can be used for incredibly expressive sounds given solid programming and playing technique.

So what is the best way to configure and program these synthesis components effectively? The answer could fill a book's worth of explanations and examples. Two such recommended books on this subject are:

"Power Tools for Synthesizer Programming" by Jim Aiken, available from Backbeat Books
"Analog Synthesis" by Reinhard Smitz, available from Wizoo Publications

You can also learn a lot from examining the factory presets in detail. The Little Phatty's presets were crafted by some of the best sound designers in music today, and you can learn their secrets simply by exploring the individual parameters that makeup the sound. Just dial up a few presets and dig in!

As with all musical instruments, practice, exploration and experimentation are an important part of achieving great results. Spend a little time getting to know your new instrument - your efforts will be rewarded!

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Appendix G - MIDI Implementation Chart

MIDI Implementation Chart

Moog Music — Date: 9/20/09
Little Phatty Stage II Analog Synthesizer — Version 2.2

FUNCTION	TRANSMITTED	RECOGNIZED	REMARKS
Basic channel			
Default	1	1	
Changed	1-16, OFF	1-16, OFF	User selectable
Mode			
Default	3	4*	* Note priority is user selectable
Messages	X	X	
Altered	X	X	
Note number	24-108	0-127	The transmitted note numbers follow the OCTAVE switch setting, providing a total range of seven octaves. With no octave transposition, the transmitted range is 48 – 84 (C3-C6)
Velocity			
Note ON	O	O	
Note OFF	X	X	
After touch	X	X	
Pitch Bend	O	O	Programmable from 0 to ±12 semitones
Control change	O	O	1, 3-5, 6, 7, 9-11, 15,16, 18, 19, 21-31, 33, 36, 53, 65, 68, 69, 74, 75, 77, 88, 90, 91, 102-119
Program change	O	O	
True Number	00 - 99	00 - 99	
System Exclusive	O	O	
System Commands			
Song Position	X	X	
Song Selection	X	X	
Tune	X	X	
System Real Time			
Clock	X	O	Receives Timing Clock
Commands	X	O	Receives START, CONTINUE & STOP
Aux messages			
Local Off	X	X	
All Notes Off	O	O	
Active Sense	X	X	
System Reset	X	X	

Legend: O = Yes, X = No

Modes: Mode 1 - Omni On, Poly; Mode 2 - Omni On, Mono; Mode 3 - Omni Off, Poly; Mode 4 - Omni Off, Mono

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Appendix H - Service and Support Information

Moog Limited Warranty

Moog Music warrants its produces to be free of defects in materials or workmanship and conforming to specifications at the time of shipment for a period of one year from the date of purchase. During the warranty period, any defective products will be repaired or replaced, at Moog Music's option, on a return-to-factory basis. This warranty covers defects that Moog Music determines are no fault of the user. In countries outside of the USA, contact the Moog authorized distributor listed on our web site (www.moogmusic.com) for service.

Returning your Product to Moog Music

You must obtain prior approval in the form of an RMA (Return Material Authorization) number from Moog Music before returning any product. You can request an RMA number on-line using the 'Product Register' link on the Moog Music home page or call us at (828) 251-0090. The Little Phatty must be returned in the original inner packing including the foam inserts. The warranty will not be honored if the product is not properly packed. Once packed, send the product to Moog Music Inc. with transportation and insurance charges paid.

What we will do

Once received, we will examine the product for any obvious signs of user abuse or damage as a result of transport. If the product has been abused, damaged in transit, or is out of warranty, we will contact you with an estimate of the repair cost.

How to initiate your warranty

Please initiate your warranty on-line at www.moogmusic.com by clicking on the "Product Register" tab. If you do not have web access, fill out the all the information on the included warranty card and mail to:

Moog Music, Inc.
Attn: New Product Registration
2004-E Riverside Dr.
Asheville, N.C. USA 28804

Appendix I - Caring for the Little Phatty

Clean the Little Phatty with a soft, moist cloth only – do not use solvents or abrasive detergents. Heed the safety warnings at the beginning of the manual. Don't drop the unit. If you are shipping your Little Phatty to the factory for servicing, we recommend using the original shipping carton, or an ATA approved Road Case. Shipping the Little Phatty in a non-ATA or packaging other than the original carton will void the warranty. When setting up the Little Phatty, be sure your stand or table is capable of holding at least 25 lbs.

AN IMPORTANT NOTE ABOUT SAFETY: Do not open the chassis. There are no user serviceable parts in the Little Phatty. Maintenance of the Little Phatty synthesizer should be referred to qualified service personnel only.

Appendix J - Using the CP-251 with the Little Phatty

The Moogerfooger® CP-251 Control Processor makes an ideal companion to the Little Phatty synthesizer. The CP-251 provides an LFO with two waveforms (Triangle/Square), a Sample & Hold circuit with two outputs (stepped/smooth), a Lag Processor, a Noise source, a Mixer and two Attenuators. The CP-251 greatly expands the sonic palate of the LP, allowing for the creation of interesting new sonic textures.

Here are some possible configurations for using the CP-251 with the Little Phatty. Grab some patch cords and try these ideas!

Simple configurations using the LFO from the CP-251:

To create a steady Vibrato effect:

- Using a ¼" patch cable, connect the CP-251 LFO Triangle output to an Attenuator Input.
- With another ¼" patch cable, connect the Attenuator Output to the LP's Pitch CV jack.

On the CP-251, set the LFO Rate control to 6 Hz (about 1 o'clock), and adjust the Attenuator to about 0.5 on the dial (a very low amount). This configuration will produce the mild pitch wavering known as vibrato. Setting the LFO Rate considerably higher will result in wild FM textures.

To create Tremolo:

- Using a ¼" patch cable, connect the CP-251 LFO Triangle output to an Attenuator Input
- With another ¼" patch cable, connect the Attenuator Output to the LP's Volume CV jack.

On the CP-251, set the LFO Rate control to 6 Hz (about 1 o'clock), and adjust the Attenuator to 10 on the dial. This will produce the pulsating amplitude modulation known as tremolo. Adjust the LFO Rate to taste. For a sharp, volume-chopping effect, use the LFO Square wave output in place of the LFO Triangle out.

To produce Timbral Modulation:

- Using a ¼" patch cable, connect the CP-251 LFO Triangle output to an Attenuator Input
- With another ¼" patch cable, connect the Attenuator Output to the LP's Filter CV jack.

On the CP-251, set the LFO Rate control to 6 Hz (about 1 o'clock), and adjust the Attenuator to about 2 on the dial. This will produce a pleasing tone modulation as the filter cutoff frequency is modulated. Setting the LFO Rate considerably higher will result in wild timbral textures, while a very low setting will create a slowly evolving filter sweep. For a "random stepping" filter effect, use the S&H Out 1 in place of the LFO Triangle out.

Using the multiple jack on the CP-251, you can simultaneously route the LFO or S&H modulation signal to the LP's Pitch, Filter and Volume inputs all at once, or split the modulation signal using the multiple jack and route it into both Attenuators to have two separately controllable modulation sources for the LP.

Pitch Transposition:

Using an Expression Pedal (like the Moog EP-2), you can program the CP-251 to transpose the LP's pitch to any interval desired and have it ready any time you need it. Here's the connection:

- Connect the EP-2 to an Attenuator Input.
- With another ¼" patch cable, connect the Attenuator Output to the LP's Pitch CV jack.

To set the transposition interval, press the EP-2 footpedal all the way down and slowly adjust the Attenuator on the CP-251 while striking a note on the LP. The pitch will go up as you raise the Attenuator level. Rock the EP-2 pedal between full up and full down positions to hear the difference in pitch, and adjust the Attenuator until the desired interval is reached. This will give you a foot-activated transposition controller you can use at any time during a performance!

Noise as a Control Voltage:

You can use the CP-251 Noise source as a control voltage by simply routing it to any of the LP's CV inputs (Pitch, Filter and Volume), but a better method is to route the Noise through an Attenuator first:

- Using a ¼" patch cable, connect the CP-251 Noise output to an Attenuator input.
- With another ¼" patch cable, connect the Attenuator output to one of the LP's CV jacks.

This will allow you to raise or lower the Noise level as desired, adding just a touch of noise to add realism to a sound, or a blast of noise for extreme sonic effect.

Combining Control Voltages:

Using the CP-251 Mixer, you can add the LFO and Noise source together for use as a combined control voltage signal, giving a result similar to using the Modulation Mix control on the original Minimoog:

- Using a ¼" patch cable, connect the LFO Triangle output to the CP-251 Mixer 1 input
- Using another ¼" patch cable, connect the Noise output to the CP-251 Mixer 2 input
- With another ¼" patch cable, connect the Mixer "+" output to the LP's Filter CV jack.

Set the CP-251 Mixer 1 and Mixer 2 inputs to '5' on the dial, and set the Master level to '10'. Adjust the Mixer 1 and 2 levels to balance the LFO and Noise signals, and use the Master level to set the effect intensity.

You can also use the Mixer's Offset Voltage control by itself to provide an additional steady CV signal, or combine it with the LFO and Noise. An interesting effect is to mix the LFO and Noise source together with a negative offset (set the Mixer Offset control to about 9 o'clock) and route the Mixer Output to the LP Filter Input. As the Mixer's Master control is raised, the LP's Filter Cutoff will be lowered (due to the negative offset voltage) while the combined LFO/Noise signal is introduced.

Noise as an Audio Source:

Don't forget that you can use the CP-251 Noise source as an audio source to add interesting artifacts to an existing sound (for example, creating the illusion of 'breath' in an instrument) or process the noise just by itself to create wind, surf, or 'pole' noises. Simply route the CP-251 Noise output through an attenuator and then into the LP's Audio In jack. Noise never sounded so good!

We've just scratched the Surface

These are just a few of the synthesis possibilities afforded by the Little Phatty and the CP-251. Other CV equipment like our Moogerfooger® analog effects can be added to expand the sonic potential of the Little Phatty. Other CV compatible equipment can be connected as well. Just keep in mind that you should always connect a source to a destination, and that you shouldn't combine multiple CV to a single destination without a mixer. We encourage you to experiment, as there are many possibilities for exploring synthesis – whether you are trying to duplicate a sound or effect you heard, or if you are trying to make a sound that nobody's heard before. Remember - experimentation is part of the fun!

Appendix K - Specifications

Type:

Programmable monophonic analog synthesizer w/100 presets

Synth Engine:

Oscillator Section:

Oscillator 1:

Octave: 16', 8', 4', 2'

Wave: Continuously variable (triangle/sawtooth/square/pulse)

Level: 0 to 100%

Oscillator 2:

Frequency: ± 7 semitones

Octave: 16', 8', 4', 2'

Wave: Continuously variable (triangle/sawtooth/square/pulse)

Level: 0 to 100%

Glide Rate: 0 to 100%

Oscillator Sync ON/OFF

Filter Section:

Cutoff: 20Hz to 16KHz

Resonance: 0 to Self-oscillation

Keyboard Amount: 0 to 100%

Filter Env. Amount: -100% to +100%

Overload: Variable pre and post distortion, adds +6dB signal boost at full level.

Envelope Generator Section (x2):

Attack Time: 0.001 to 10 seconds

Decay Time: 0.001 to 10 seconds

Sustain Level: 0 to 100%

Release Time: 0.001 to 10 seconds

Modulation Section:

LFO Rate: 0.2 Hz to 50 Hz

Source: LFO triangle, LFO square, LFO sawtooth, LFO ramp, Filter EG, Oscillator 2

Destination: Pitch, Oscillator 2, Filter, Wave

Amount: 0 to 100%

Keyboard:

37 keys (C-C)

Transmits polyphonic MIDI Note On/Off with velocity

Performance Controls:

Pitch Wheel: programmable, up to ±12 semitones

Modulation Wheel: 0 to 100%

Fine Tune: ±3 semitones

Glide ON/OFF

Octave UP/DOWN: ±2 octaves

Output ON/OFF

Master Volume

Analog Edit Potentiometers (4)

User Interface:

LCD Display, 2 x 16 characters

Mode switches:

Master

Preset

Selection/Navigation controls:

Cursor

Enter/Store

Value encoder (with pushswitch)

Side Panel:

AC Power Inlet (universal power supply, 100-250 VAC, 50-60 Hz, power consumption: 12 Watts)

Power ON/OFF

Audio Out

Ext. Audio In (accepts +4dBu line level signal)

Control Voltage Inputs:

Pitch CV: -5 to + 5V

Filter CV: -5 to +5V

Volume CV: 0 to +5V

Keyboard Gate: +5V trigger

MIDI In, Out

Outputs:

Monophonic Audio Out (on side panel)

Headphone jack (¼" TRS on front panel)

Dimensions:

26.75" x 14.75" x 6.75"

(679.5 mm x 374.7 mm x 141.5 mm)

Weight:

22lb (9.9 kg)

Operating System;

Flash upgradeable via MIDI SysEx

Specifications subject to change without notice

Glossary

Here are a few key terms that cover the basics of sound generation as used in the Little Phatty synthesizer.

ADSR – Abbreviation for Attack, Decay, Sustain and Release, the four stages of an envelope control voltage.

Amplitude – The strength of a sound's vibration measured in Decibels (dB). Amplitude corresponds to the musical term Loudness.

Continuous Controller (CC) – A type of MIDI message used to transmit control commands. These commands are digital control signals for parameters such as volume, vibrato and panning.

Control Voltage – Control voltages (also called CVs) are used in analog synthesizers to affect changes in the sound. In the case of pitch, pressing a key on the keyboard sends a control voltage that determines the pitch of the oscillators. The keyboard CV is set to produce an equal tempered scale. As you play up the keyboard, the CV is raised and the pitch increases. The pitch can also be affected by other CV sources, like an LFO, often used to produce vibrato. Other major synthesizer components that respond to CV's include the filter (the higher the CV, the higher the filter cutoff frequency) and the amplifier (the higher the CV, the higher the gain, or volume).

Envelope – An envelope describes the contours that affect the characteristics of a sound (pitch, tone and volume) over time. For example, when a string is plucked, its amplitude is suddenly very loud, but then dies out gradually. This describes the Volume envelope of the sound. We observe that the initial part of the plucked sound is very bright, but then the brightness fades away. This describes the Tonal envelope contour. We also hear the frequency of the sound go slightly higher when the string is plucked, and then drop slightly as the note fades. This is the pitch envelope contour. A synthesizer can create these kinds of changes by applying electrically generated envelopes to oscillators (affecting pitch), filters (affecting tone) and amplifiers (affecting volume).

Envelope Generator – A circuit that generates an envelope signal. The envelope generator creates a time-varying signal that can be applied to any voltage-controlled circuit. The Envelope Generators in the Little Phatty have four adjustable segments: Attack, Decay, Sustain and Release, also sometimes referred to as ADSR. The Attack, Decay and Release segments are specified as time parameters, while the Sustain segment is a simply a level setting. Attack specifies the onset time of the envelope. For example, the sound of a plucked string starts suddenly, meaning its volume envelope has a fast attack time. Decay specifies how quickly the onset of the envelope fades into the sustained portion. Sustain is the level at which the envelope sustains after the initial transient (the attack and decay portion). Finally, Release determines how long the envelope takes to fade away. An Envelope Generator uses a trigger to start and stop the ADSR envelope. This trigger is called a gate signal, and it's produced whenever a key is pressed on the keyboard. The gate signal turns on and stays on as long as a key is held down. When the key is released, the gate signal turns off. When the gate is on, the Envelope Generator is triggered and the envelope signal moves through the Attack and Decay segments and settles at the Sustain level as long as the gate signal is on. When the gate goes off, the release segment of the envelope begins. A new gate signal retriggers the Envelope Generator.

EEPROM – EEPROM stands for 'Electrically Erasable Programmable Read Only Memory'. This is a type of digital memory used to store information, even after the power is turned off. In the Little Phatty, the EEPROM is used to store global settings and presets, and operating system parameters such as tuning information.

Filter – A circuit that removes some frequencies and allows other frequencies to pass through the circuit. A filter has a cutoff frequency that determines the point at which frequencies begin to be removed. A lowpass filter is one in which frequencies above the cutoff frequency are removed and all frequencies below the cutoff are passed through. A highpass filter is one in which frequencies below the cutoff frequency are removed and frequencies above the cutoff are passed through. A bandpass filter has two cutoff frequencies that define a frequency band, outside of which the frequencies are removed.

Frequency – The rate of vibration in sound measured in Hertz (Hz or cycles per second). The average hearing range of the human ear is from 20 to 20,000 Hz. Frequency corresponds to the musical term 'pitch', but the two terms are not always interchangeable. Frequency is an objective measurement of a sound, while pitch is the perception of a sound, low, high, or mid-ranged. A low frequency corresponds to a low-pitched sound such as a bass; a high frequency sound corresponds to a high-pitched sound such as a piccolo. In music, a change in pitch of one octave higher equals a doubling of the frequency.

Frequency Modulation – Also known as FM, Frequency Modulation describes the technique of using one oscillator to modulate the frequency of another. In FM, the modulating oscillator is called the 'modulator', while the other oscillator is known as the 'carrier'. The carrier oscillator is the one you hear. When the modulator frequency is very low (about 6Hz), the effect is described as vibrato. As the modulator frequency is raised into the audio range, new modulation frequency components are created, and the effect is perceived as adding new overtones to the carrier signal.

Glide – Also called portamento, is the slowing down of pitch changes as you play different notes on the keyboard. Certain acoustic instruments, like the trombone or the violin, create this effect when the performer adjusts the tubing or string length. The speed of the glide is the glide rate. In synthesizers, a Glide Rate control determines the speed of the glide between notes.

Harmonic – A sound is made up of simple vibrations at many different frequencies (called harmonics) that give a sound its particular character. This corresponds to the musical term timbre or tone color. A harmonic sound, such as a vibrating string, is one in which the harmonics are mathematically related by what is called the harmonic series. These sounds are typically pleasing to the ear and generally the consecutive vibrations have the same characteristic shape or waveform. An enharmonic sound, such as a crash cymbal, is one in which the harmonics are not mathematically related. Their waveforms look chaotic. White noise is an enharmonic sound that contains equal amounts of all frequencies.

Little Phatty – A monophonic analog synthesizer designed by Bob Moog that is a descendant of the classic Minimoog.

LED (Light Emitting Diode) – An electrical component that lights up when a voltage is applied.

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Low Frequency Oscillator – Also called an LFO, this is a special type of oscillator that generates signals primarily below the range of human hearing (generally below 20 Hz). LFOs are typically used as a source of modulation. For instance, an LFO with a triangle waveform, set to about 6 Hz and modulating the pitch of a VCO results in vibrato. Changing the LFO waveform to a square wave will result in a trill. An LFO modulating a VCA with a triangle wave creates tremolo.

LUT (Lookup Table) – A Lookup Table is a type of software data structure used to provide basic reference information to the operating system. In the Little Phatty, LUT's store tuning values and other parameters used by the operating system to provide precise and efficient operation.

Mixer – A circuit for combining multiple sound sources or signals.

Modulation – Modulation is the use of a control voltage to shape a tone. Modulation has a source, a destination, and an amount. This could be as simple as the filter cutoff of a VCF (a modulation destination) being changed by the front panel cutoff control (the source), or as complex as mixing multiple CVs together to modulate filter cutoff. Modulation is used in synthesis to create complex sounds and add variation.

Noise – A random audio signal having no fundamental, and where all the harmonics have equal strength (more or less). Noise can be used as either an audio or modulation source. When used as an audio source, noise can be used by itself to synthesize explosions or wind noises, or can be mixed with other waveforms to create noise artifacts, such as breath sounds. When used as a modulation source, noise can introduce instabilities to a sound, such as a 'pitch cloud' effect when noise modulates an oscillator. In the Little Phatty, noise is available as a modulation source only, but external noise sources (such as from the CP-251 Control Processor) can be applied through the LP's Audio Input.

Oscillator – A circuit that electronically "vibrates". When used as a sound source, an oscillator is the electronic equivalent of a vibrating reed, or string. When amplified, an oscillator produces a pitched sound whose frequency is determined by one or more control voltages. Changes to these voltages correspond to changes in pitch. An oscillator's vibration can have different shapes or waveforms, such as a triangle, sawtooth, or square wave. The Little Phatty has two oscillators for generating sounds.

Pitch – The subjective perception of sound. A bass guitar generates low pitches, while a flute generates high pitches.

Pole (or poles) – A term referring to the design of a filter circuit. Each filter pole adds 6 dB/Octave of attenuation to the filter response, so while a single pole filter has a 6dB/Octave response, a 4-pole filter (like the one in the Little Phatty) has a 24dB/Octave response.

Sample and Hold (S&H) – A circuit that generates a random control voltage at regular intervals. Traditional sample and hold circuits employ white noise as a signal source, taking periodic samples of this signal and holding that sample (a voltage level) until the next sample is taken. Since the signal source is noise (a random audio signal), the output of the S&H circuit is also random. The sampling interval is typically controlled by a low frequency oscillator (LFO). By adjusting the speed of the LFO, the speed of the S&H circuit can be varied. In the Little Phatty, digital circuitry is used to simulate an equivalent S&H circuit, and the LFO Rate control sets the speed. The S&H output is available as a programmable modulation source.

Sound – Audible vibrations of air pressure. For electronic sounds such as those produced by a synthesizer, loudspeakers are used translate the electrical vibrations into the changes in air pressure which we perceive as sound.

Subtractive synthesis – A method of creating tones using harmonically rich (bright) source material, and then removing (or in some cases emphasizing) various frequency components to create the desired sound.

Synthesis – The generation of sound by electronic means, where the programmer or performer has the ability to change the pitch, volume, timbre and articulation.

Timbre – Pronounced 'tamber', it refers to the quality of a sound by its overtones. An unprocessed sawtooth wave has a bright timbre, while a triangle wave has a mellow timbre.

Tremolo – Technically a form of low frequency amplitude modulation, tremolo is a smooth audible pulsing of volume. In synthesizers, tremolo is produced when a 5-6Hz LFO triangle or sine wave signal is applied to a voltage controlled amplifier.

Waveform – The shape of an oscillator's vibration. This determines its timbre. Commonly used waveforms in subtractive synthesis are sawtooth, triangle, square, or rectangular. Different waveforms have different timbres. A sawtooth has the greatest number of harmonics, and sounds bright and buzzy. A square wave has only odd harmonics, and sounds bright, but hollow, like a clarinet. A rectangular wave can vary in shape, but typically has a bright but thin sound, and a triangle wave's harmonics are so low in amplitude that it sounds muted and flutelike.

VCA – Short for Voltage Controlled Amplifier, a VCA is an amplifier circuit where the gain is a function of the control voltage. In the Little Phatty, the VCA is paired with the Volume ADSR envelope generator to specify the articulation of a sound. Another CV source for the VCA in the Little Phatty is the Volume CV Input.

VCF – Short for Voltage Controlled Filter, a VCF is a filter circuit where the filter cutoff frequency is a function of the control voltage. A VCF is used to control the timbre of a sound. In the Little Phatty, the VCF is paired with the Filter ADSR envelope generator for dynamic control. Other CV sources for the VCF include the Keyboard Amount, Modulation Matrix and Filter CV Input.

VCO – Short for Voltage Controlled Oscillator, a VCO is an oscillator circuit where the oscillator frequency is a function of the control voltage. In the Little Phatty, the VCO is primarily controlled from the keyboard. Other CV sources for the VCO include the Modulation Matrix, and Pitch CV Input.

Vibrato – Technically a very low frequency modulation, vibrato is a smooth, mild pitch warble. In synthesizers, vibrato is produced when a 5-6Hz LFO triangle or sine wave signal is applied to a voltage controlled oscillator, causing the pitch to deviate slightly above and below the base frequency.

LP Stage II Presets

A list of the Stage II Presets appears on the next page. Many of the preset names are self-explanatory, some are for fun, and all are all worth auditioning. As you listen to the presets, don't forget check out the Mod Wheel for additional performance control.

Stage II Preset Contributors: Steve Dunnington
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Text and illustrations by Greg Kist, Cyril Lance & Amos Gaynes

Little Phatty Stage II Presets

00	MOOG STAGE II	25	BLOWOUT BASS	50	DARKNESS2	75	KICK IT QUICK
01	AMPHIBIANBASS	26	ADAM BASS 1	51	VAGUELY VOCAL	76	AGOGO A GO GO
02	TAURUS BASS3	27	LITTLE TAURUS	52	SLOWMO LEAD	77	SIZZLEMOD HIT
03	SONIC GROOVE	28	LITTLETAURUS2	53	MISCHIEVOUS	78	SUPER SUB HIT
04	PIAZOLA	29	LITTLETAURUS3	54	PUNK PANTHER	79	FM PLUCK
05	LAMBSBREAD	30	TAURUS BASS	55	THAT 70S LEAD	80	SINE OFF
06	4WAKEMAN	31	TAURUS BASS2	56	FREQ MOD	81	RUBBER KOTO
07	BREAKING TOYS	32	TAURUS TUBA	57	MARY ALICE	82	PICK SIDES
08	ADAMLEAD2	33	MINIBASS	58	MISTINGUETT	83	PUCK SAYS MOD
09	FILTERMOD	34	CLASS BASS	59	CUTTING ZINC	84	FUSIONANOMALY
10	UPFRONT BASS	35	PHONY HOHNER	60	SQUEEGIELEAD	85	HARD NOIZ MOD
11	IT GOES TO 11	36	1975 STRINGS	61	WHL BRITELEAD	86	BOUNCY SEQ
12	BASS MAN	37	SAHASRARA	62	KINDERMOOG	87	SPECIAL TINE
13	SOLID1 BASS	38	FILTERMADNESS	63	POSH MOOG	88	BRASSTINE ARP
14	INTERCEPTOR	39	COSMONAUT	64	EDGY VIBRATO	89	BRASS REZ
15	SALI VATION	40	ALIENS MDWHL	65	OVERTONIC	90	2 NASTY
16	ELECTROFLUX	41	SESAME ST	66	SUMMER LEAD	91	COUNT HUCULA
17	BITCRUSHER	42	THIRD EYE	67	HAPPY MOOG	92	DARKNESS
18	SLOW SNH BASS	43	HENRY THE 3RD	68	ADAMLEAD1	93	2WAW FUNK
19	ZOMBIFIED	44	FORERUNNER	69	HERBIE	94	SOFT FUR
20	FOUNDATION	45	REZZY FOURTH	70	SOFT LEAD	95	DARQUE N HARD
21	SEEKER BASS	46	TRIPPYMOD	71	QUASAR LEAD	96	CLEARMYTHROAT
22	PULSAR BASS	47	TRANSPHATTY	72	EARLY LABS	97	HARD RINGER
23	ATOM BOM BASS	48	REZZIN WORM	73	ZAWICHICK	98	TALKBOX 2
24	ALKALINE BASS	49	POT SYNC	74	LESLIE PAUL	99	JOTTED 8TH

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